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THE FOUNDRY

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A Modern Foundry in Europe.

BY HENRY GRETENER.

(Continued from August Number.)

Second. "Ireland": Diameter of stack is 6 ft. 1½ ins.; diameter inside of lining at tuyeres, 2 ft. 9½ ins.; diameter below charging door, 3 ft. 11¼ ins. This cupola has only got two rows of tuyeres, the lower ones, four in number and 7 ins. diameter, are 20 ins. from the sand bed; from center of lower tuyeres to center of upper tuyeres, 17¾ ins. There are eight tuyeres in the upper row, of 2⅜ ins. diameter. Both upper and lower tuyeres go horizontally through the lining. The wind box on this cupola is inside the stack covered over with the lining. The capacity of this cupola is 8 tons per hour. The charges are as a rule 133 lbs. of coke and 2,203 lbs. of iron. The bed fuel on an average is 1,545 lbs. of coke. The receiver on both cupolas has a slag hole to one side, which, however, is only used during very large heats. The above data are taken from one of the daily melting sheets of the concern and are absolutely correct.

The blast for the cupolas is furnished by a Root's blower, made in England, which runs at about 800 revolutions per minute and by a fan running at 1,500 revolutions, of the firm's own make, this being one of their specialties. The Root's blower only furnishes blast enough for one cupola, as soon as two cupolas are running together, the fan has to be started, to assist the blower. These two machines are blowing into the same mainpipe and are placed in a separate room under the cupola platform where they are driven by a Ball & Wood engine, purchased in New York.

Near the cupolas, but separated from the main building by a wall with a very large door in it, is the new cleaning room for the heavy castings, 128 ft. long with a traveling crane of 40 ft. span running the entire length. In the center of this room runs an underground channel 9 ft. 10 ins. deep, built in concrete. At one end of the room it is about 6 ft. 6 ins. wide, at the other end 10 ft. 10 ins. At intervals of 12 ft. it has branches running off at right angles, which open through the floor, covered with grid irons. At the large end of this channel is located a propeller shaped fan on a horizontal shaft, which, in revolving, draws air through the grid irons into the channel and through the fan into a vertical shaft in one corner, leading through the roof. This current of air also takes the fine dust out of the cleaning room, thus adding largely to the comfort of the men employed in this part of the building. The vertical shaft, instead of going straight up through the roof, has a bend in it, leading on top of the two drying ovens previously mentioned in the new addition. There a sprinkling arrangement, consisting of five sprinklers of novel design, is placed in such a position that the whole cross section of the shaft is filled with the fine vapor produced by the sprinklers. In this way it is expected to settle all the dust in the bend of the shaft, instead of throwing it out on the roof. The sprinkler part of the dust extricating plant was just being put in at the time of writing and had not yet been tested.

Before going over to the description of the foundry for light work I must not forget to mention the great care with which the large ladles of this concern are fitted up. They are all made very strong, and the worms are all cut on a lathe so as to get a very smooth running gear, which latter is also provided with oil cups on all journals. Outside of the building is located a drop in a closed shed and in another building is the plant for furnishing a power of 250 horsepower for the electric cranes in both foundries and also for the electric lights, of which there are in the shop for large work twenty-four arc lamps at 10 ampheres and ten at 15 ampheres; five in the cleaning room at 10 ampheres, and four in the yard at 10 ampheres. In the foundry

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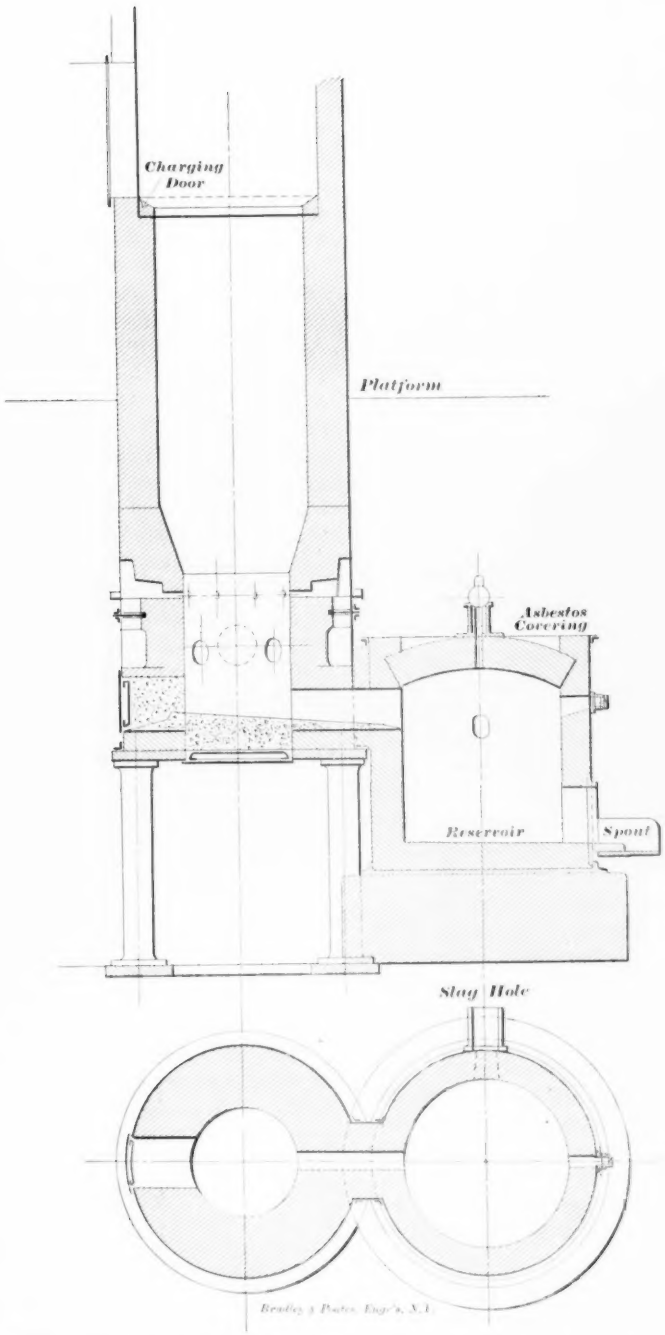

FIG. 12 A—VERTICAL AND HORIZONTAL CROSS SECTIONAL VIEWS OF IRELAND CUPOLA IN SULZER BROS.' FOUNDRY, AT WINTERTHUR, SWITZERLAND, SHOWING RESERVOIR.

for light work they have four lamps at 15 ampheres, fourteen at 10 ampheres, and eleven at 8 ampheres. Two pig iron breakers, one belt driven and the other steam driven, of American make, break the pig iron in lengths of 7 or 8 inches.

The foundry for light work is a building of somewhat irregular shape. Its largest dimensions are 380 ft. long and 160 ft. wide, with an annex built to it, containing the sand chambers in the basement, a large shipping room on the first floor and offices on the second floor. Adjoining the annex, also on the second floor is located the sand mixing room. By far the largest part of this foundry building is covered with the flat roof described at the beginning of this article.

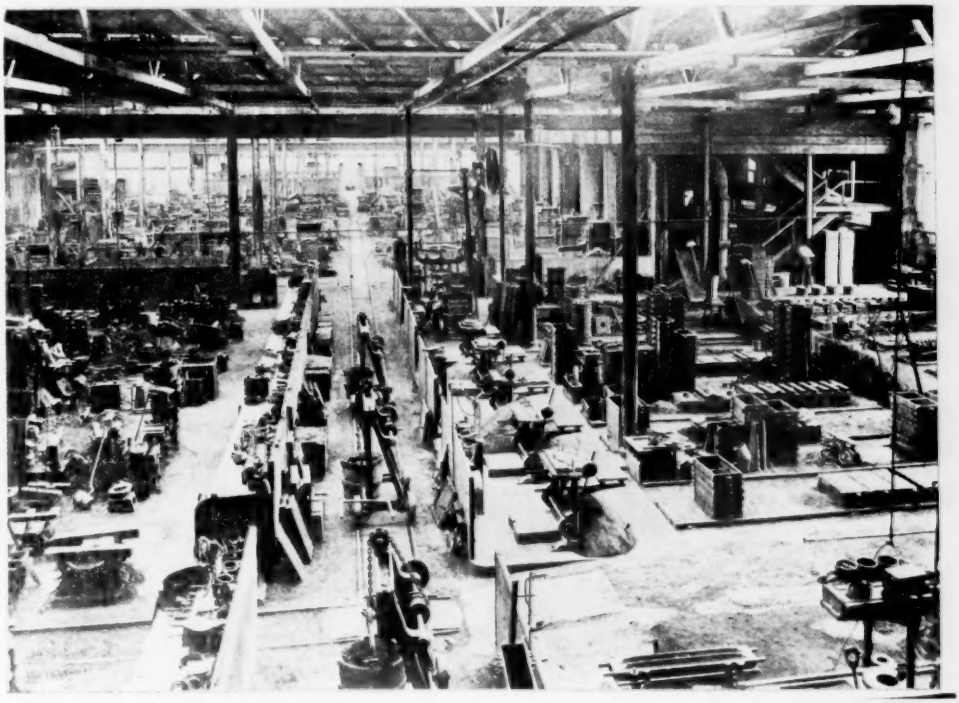

FIG. 13—INTERIOR OF FOUNDRY FOR LIGHT WORK.

Fig. 13 shows a view of the whole interior. The output consists mostly of radiators, cotton mill machinery, loom work, light steam engine work, etc. To the left is seen the machine molding floor of which a separate view is given in Fig. 14. The machines along the benches (see Fig. 14) are all hand molding machines of uniform design, where the sand is pressed in the flask with a lever arrangement, with the exception of one machine, which is used for making radiators of a shape shown in Fig. 15. The thin ribs are molded with the aid of a stripping plate. The sand is rounded in by hand and then the pattern drawn through the plate. The thickness of the ribs is about 3-32 in. at the top, their depth 1¾ ins. In the rear of Fig. 14 and also partly shown in the left hand corner of Fig. 13, are seen two hydraulic molding machines, used for making radiators and similar work. The piston of these machines is 5¾ ins. diameter, the water pressure 370 lbs. per inch. A track extends on each side of the machine, with one carriage to the right and one to the left, each carrying a pattern. One man fills his flask, runs the carriage under the machine and after applying the pressure, makes room for the man on the other side. In one corner of the rear wall is seen the accumulator, with which these machines are operated. On the same floor are also located several other molding machines of various designs, one of them electrically driven, made by Aiken &

Drummond, in Louisville, Ky. It would lead too far, however, to go much into the details of the construction of any of them.

To the right in Fig. 13 is shown part of the bench molding floor, where a regular school for apprentices is arranged, for from thirty to forty apprentices under the supervision of a special foreman, as the firm thoroughly believes in the principle of raising their own men. The boys start in the core room from where they go into this department. The time they have to serve is four years, three of which are spent in the foundry for light work. From there they go, according to their abilities, to the heavy pattern work and molding with the sweep in sand and loam. Each molder has got a small cupboard on his bench,one of which isseen to the left in Fig. 16, in which to keep his small tools. It will be noticed that there are no wooden flasks to be seen anywhere, neither are there any snap flasks used on this floor. In spite of all the efforts made to introduce the latter, of which a number were bought at one time, the men refused to adopt them for reasons not known to the writer.

In the rear of the bench molding floor and on the gallery above the core room is located. There are, besides others, a few of Millett's patent core ovens in use, that were sent over from the States and are giving excellent satisfaction. For making round cores up to 4 ins. diameter and 12 ins. long they use two special machines. Between two side frames is located an adjustable bracket with a vertical rod, on top of which can be screwed a disc of any diameter up to 4 ins. A hand wheel and shaft, placed in the lower part of the frame, have crank pins, to which are attached connecting rods, carrying on their upper ends a movable plate, also guided in the frames, in the center of which can be set bushings with a bore up to 4 ins. For making a core, the plate is raised up, until the distance from the top of it to the disk, which fits inside the bushing, is the same as the length of core desired, the sand rammed in and by another half turn of the hand wheel the plate drops back again, leaving the core standing free. The machine is specially useful, where many cores of the same size have to be made, but as it is now de-

FIG. 14—HAND MOLDING MACHINES.

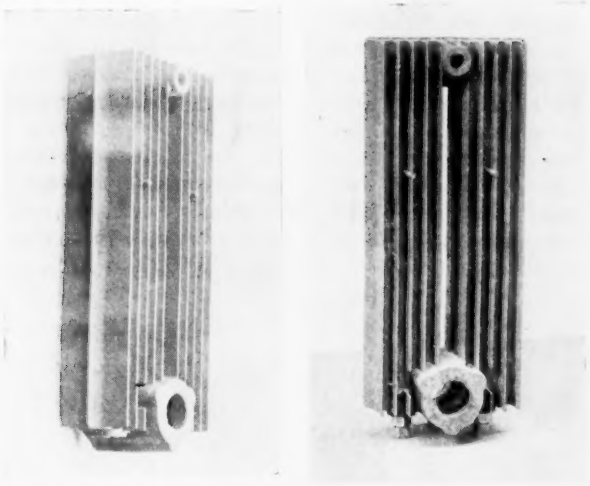

FIG. 15—RADIATORS MADE ON HYDRAULIC MOLDING MACHINE.

signed, the cores are perfectly straight and if any taper is desired by the molder for the part fitting in the cope print, it must be put on with a file before setting it. A dumb-waiter carries the cores from the gallery down to the floor.

Fig. 16 shows the bay used for making the larger radiators. Two molding machines,

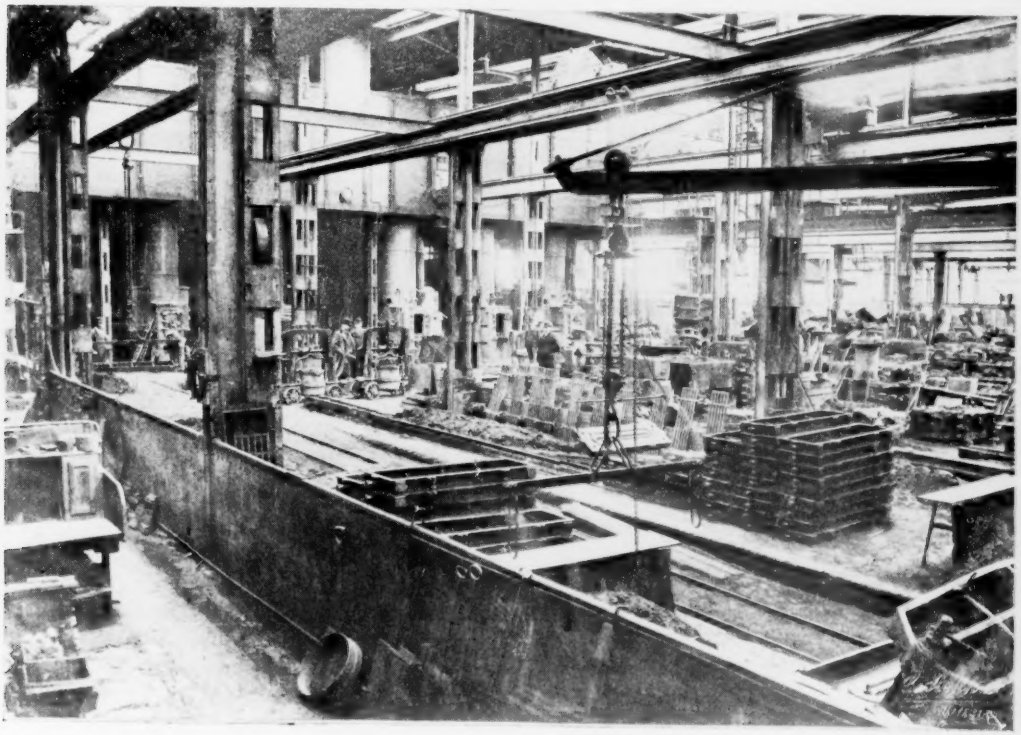

FIG. 16—SHOWING CUPBOARD OR CLOSET ALLOTTED TO EACH MOLDER, ALSO FOUR OF THE SIX CUPOLAS.

one partly shown in the right hand corner of the picture, are located here. The one shown is a hydraulic machine, the other is operated by hand. To each one belong four men. The pattern plate on the hydraulic machine is kept warm by a steampipe cast in it, on the hand machine by a gas pipe, so as to make it lift out of the sand better. Over the two machines is placed a jib crane with a small chain hoist. For setting the flasks A straight edge also seen under the flask with a notch at one end fitting in one of the rails, is used for sweeping the sand between the rails. Four projections on the straight edge sweep as many grooves in the sand to let the gases escape from under the flasks. The iron grates seen standing along the side, are used for bolting the copes down to the drags. Each radiator is tested under a water pressure of 9 atmospheres, or 135 lbs.

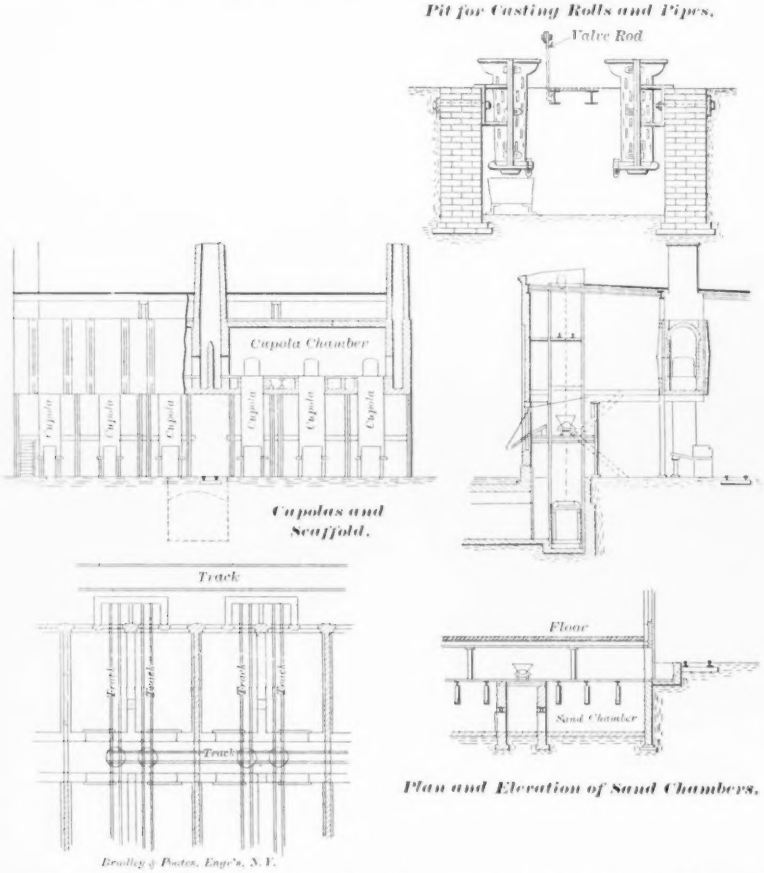

FIG. 16 A—PIT FOR CASTING ROLLS—ARRANGEMENT OF CUPOLAS AND SCAFFOLD—PLAN AND ELEVATION OF SAND CHAMBERS.

out on the floor, the two overhead run ways with trolley and chain hoist shown in Fig. 16 are used. For pouring the flasks are laid on inclined beds, so that the heavy end or foot of the radiator, where most of the gases are developed, are placed higher. These beds, which are seen under the suspended flask, are built of brick, covered with sand and with an iron rail at upper and lower side. per square inch. In the next bay is a handy arrangement for casting straight and taper rolls for cotton milling and similar machinery, up to about 9 ft. in length on end. It is shown in Fig. 16 A, and consists of a pit with brick walls all round. To the front and rear walls are fastened the flasks with bolts that are anchored through the walls. The front part of the flasks is fastened to the

rear with edges so that it can be loosened and slid a short distance back on pins. In this manner the sand can be knocked out conveniently after the mold is poured off. Both parts, of course, are well perforated so that the gases can escape, and to the bottom is hinged a cover with a turned taper recess in it, to set the core by. On top the latter is exactly of the same size as the mold, which is closed up in this manner. There is room enough in the pits under the flasks to set a small coal furnace for drying the mold. Between the two rows of flasks is a light platform resting on I beams, along the side of which runs a rod actuating the valve of the hydraulic traveling crane, which is placed on the track over head. This crane is used for drawing the patterns, setting the cores and handling the castings. Besides the hydraulic crane there are in this and the next four bays two hand cranes and six electric traveling cranes of the three motor system with from 4 to 5 tons capacity. Under these cranes the somewhat heavier castings for cotton milling machines and steam engine details suited for this size of cranes are cast.

Fig. 17 shows some pulley molding machines, the principle of which can readily be seen from the picture. The flat table consists of a large number of concentric rings, each one of which can be raised up as high as 8 ins. from the table by turning the large hand wheel, thus forming one-half of the rim. With the small hand wheel seen to the right, the pointer between the two wheels can be raised or lowered in the vertical slot. This pointer must be set to the desired diameter shown on the scale next to it before turning the large wheel. The intended width of the rim is measured off when setting it. The diameters vary from 4 in. on the smaller to 39 in. on the larger pulleys, which is the largest size the machine can make. Two corresponding sets of arm patterns are kept on hand for heavier and lighter pulleys.

FIG. 17—MACHINES FOR MOLDING PULLEYS.

In Fig. 16 are plainly visible four of the six cupolas which again present some peculiar patterns. They are somewhat smaller

than those of the other foundry. The receivers, the largest of which holds 2½ tons are all square. The bottom is built of fire brick and fire clay, and the whole front is arranged as an upper and lower door, swinging on hinges. The lower door, to which is attached the tap trough, is first shut, when preparing to take off a heat, and the joints closed with fire clay through the upper smaller door. The latter overlaps the lower one and when closing it fire clay is put along the edge of it, which afterwards is rubbed depositing all the sparks and cinders, instead of letting them escape to the roof. As seen in Fig. 16 A there are three chimneys leading from the chamber through the roof, one in the center and one at each end. These are connected with the inside of the chamber by means of openings 4 ft. 7 ins. wide and 3 ft. 11 ins. high. For each cupola an arched opening is cut through the wall of the chamber towards the scaffold, 2 ft. 11 ins. wide and 4 ft. 3 ins. high. These openings, however, are not provided with any

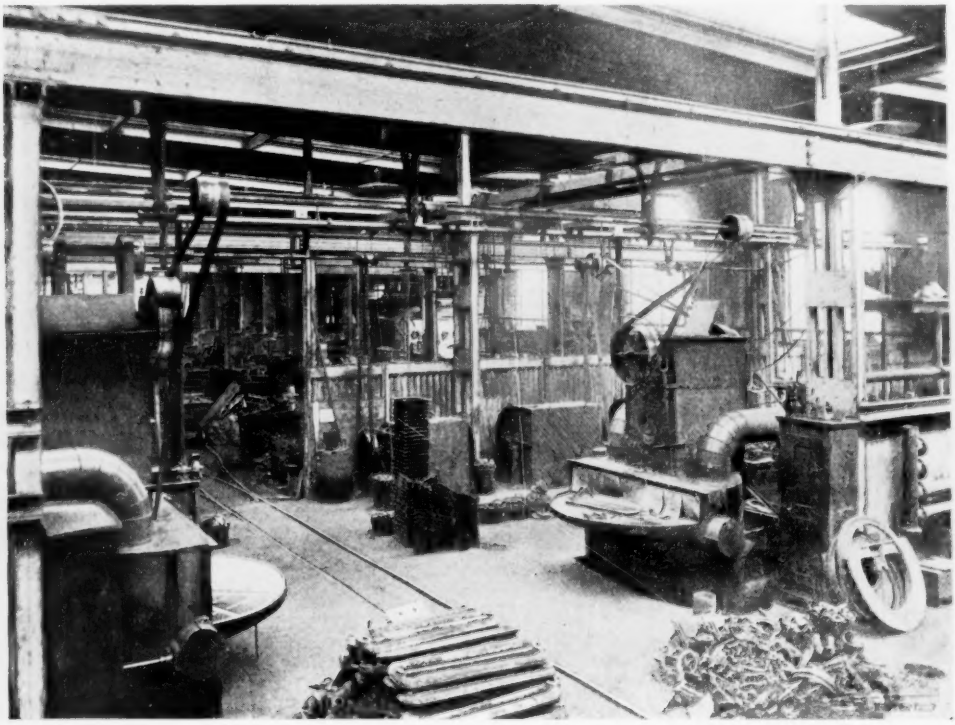

FIG. 18—SAND BLAST MACHINES FOR CLEANING CASTINGS.

all round into the joints by the cupola tender, who can reach down to the inside through a slot on top of the receiver. The inside of the doors are lined with fire brick, between two of which in the lower door is left a small opening for the tap hole. The stacks of all six cupolas only reach to about three feet above the platform, where they terminate in one common chamber 76 ft. 9 ins. long and 5 ft. 3 ins. wide, built entirely of brick. This chamber was made for the purpose of kind of a door, but are left open all the time. The scaffold, which is 17 ft. 4 ins. above the floor, extends over a space 77 ft. long and 27 ft. 9 ins. wide. Above it, at the rear, is built another narrow platform, extending over the whole length of the lower one, and carrying a track running to the elevator. All of the pig, scrap and coke, except the runners and risers, are brought to the building from the yard of the large foundry in cars by means of an underground passage under a public

thoroughfare, separating the two buildings. The 1½-ton hydraulic elevator comes down to this passage and raises the coke cars to the upper platform, and the iron cars to the scaffold. The coke cars are run along the track, and the coke dumped into several bins built on the scaffold for storing fuel and iron. In order to conveniently carry off the slag, and burnt coke, they are loaded on a small dumping car. The latter is run in the elevator to a special platform under the scaffold. There it is brought to a point near the wall,

The cleaning room comprises two and one-half bays of the building. The first two bays are provided with the underground dust extractor described previously for the cleaning room of the large foundry. One of the holes leading down to it and covered with a gridiron is seen in Fig. 18. A long cleaning table is covered on each side with a grate, over which the men clean castings, and through which a connection is also made to the underground channel. The machine with the circular table shown in the foreground of

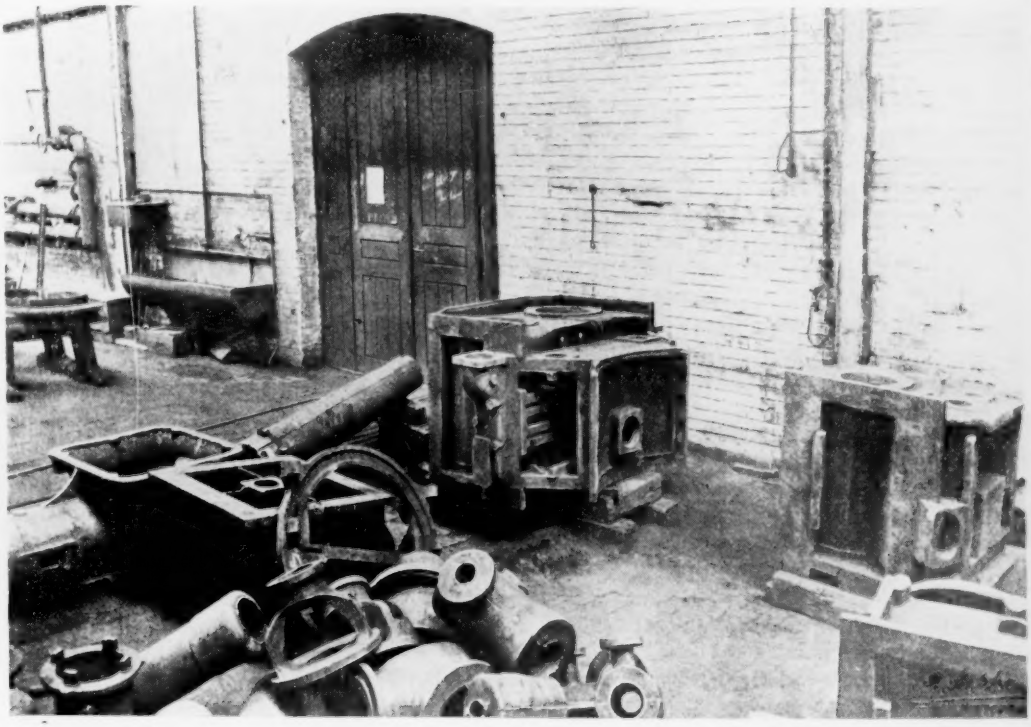

FIG. 19—CYLINDER FOR LOCOMOTIVE.

where the slags are dumped into a chute. In the wall is hinged the other half of the chute, which can be thrown out and a wagon run under it outside the building. As the cupola chamber prevents any direct communication between the scaffold and the cupola front, a speaking tube leads from one to the other, so that orders can be given from down below. An electric signal also leads from the cupolas to the power house for starting and stopping the machinery.

Fig. 18 is a sand blast arrangement which has proved very efficient and economical in cleaning small castings. There are two of these machines in operation continuously, both seen on the picture. The gridiron table on which a large number of castings can be put close together, is revolving all the time and is driven by a horizontal shaft seen on the side of the machine. Above the table in the part behind the rubber blinds, is arranged one long, narrow slot extending radi-

ally over one-half of the table. Through this opening the sand and air blast together strike the castings. The square box on top of the machine contains the sand conveyor (buckets on chain) which continuously fills a funnel on top. The large tubes, one on each side of the machine, are suction pipes, which takes all the dust into the underground channel. The blast pipe enters the machine at the rear end, and is therefore not seen on the picture. The blast pressure ought to be about 11 or 12 oz.; at present they use but 9 oz. Directly under the table is attached a wire netting, catching any small castings that may fall between the bars of the table. The sand itself falls through the netting on an inclined plane that brings it back again to the conveyor. One or generally two passages under the sand blast are enough to clean the castings on one side, whereupon they are turned over and go through the machine again. Further back are some Brown & Sharpe tumbling mills, covered over with a wooden box; the inside of the latter is lined with felt, so as to deaden the noise as much as possible. To the left of the track in line with the tumbling mills, are a number of small emery wheels, each one of which has got a pipe leading from under the wheel down to the floor and into the common dust extractor channel, to carry off the dust from the wheel. It must be specially remarked that owing to this system there is practically no dust to be seen in the whole cleaning room, and the air is as clean as can be desired in any machine shop. The line shaft operating all the machinery, as well as the dust extricating fan, are run by electric motors. Fig. 19 shows a cylinder for an inside connected locomotive that was just standing in the cleaning room at the time the pictures were taken. Both cylinders, 20 inches bore, the valve faces and the saddle for the boiler were cast in one piece, and the whole presented a remarkably fine appearance, the parts being very clean. Over this bay runs an electric traveling crane of four tons capacity, to load the castings on the cars that are brought inside the building on a track.

The next thing of interest are the sand chambers in the annex above mentioned, for storing the crude sand (Fig. 16 A). There are thirteen of these chambers, some of which are built a little larger than others, owing to the location of the building. The largest one contains 100 tons. They are partitioned off from each other by concrete walls, on which are also set the columns for the floor above. About 5 feet below the ground and 13 feet above the floor level of the chambers are located tracks for the dumping cars. These tracks run over the chambers as shown and through small doors in the front wall of the building into cuts close to the railroad track passing in front. There the dumping cars are loaded directly from the cars and run back into the building to the turn tables shown, which permit of bringing the car over the central passage to any desired chamber to the right or to the left.

There are two ways of getting the sand from these chambers to the first floor or to the sand mixing room on the second floor. The first is by means of an elevator, on which the sand is piled upon the carriage platform. On the first floor it may be taken off into a kind of covered court and put on a drying floor 27 feet long and 10 feet wide. This drying floor consists of a number of cast iron plates, under which circulates the heat in two flues from a coke fire, located in a furnace at one end of that space. The sand is spread out in layers of from 3 inches to 4 inches, and it is possible in this way to dry 150 cubic feet per day. The same elevator runs up to the second floor, the sand mixing room, where the sand can also be dried on top of the large core oven located next to this room. The second way of taking the sand right up from the chambers to the mixing room, is by means of a conveyor chain with buckets attached to it. In this case the sand down in the basement is dumped on a revolving roll, that throws it on the buckets. On the second floor is located the usual chute through which the sand is thrown on the floor. From the first to the second floor there is a similar conveyor, to bring up the burnt sand after it has passed through a sand sifter. The top of this conveyor can be seen in Fig. 20, behind the nearest column. A little to the right is seen part of the drum of a mill in which they grind the charcoal for making their own facings. The machine further to the right is a loam mixer. More to the left are seen three "Fleury" sand mixers, the middle one uncovered. The large

wheel, the face of which is seen in the picture, is intended to crush the sand, the other is a bucket wheel that takes it up and throws it on an inclined sieve, placed round the central shaft. Through the sieve it falls underneath the machine, which stands on a circular concrete base. In these machines the old and new sand is mixed according to requirements. After that it is wet with a hose to which a spray nozzle is attached, and finally it passes through a centrifugal mixer, the top of one of which is seen at the extreme left of the picture behind the water barrel. There are altogether three of these machines in line. The sand is thrown in the funnel-shaped cone located round the vertical shaft, and but little above the floor, which makes it very convenient for the men operating it. From the funnel the sand falls on a rapidly revolving disk, that has three or four rows of teeth (steel rods) projecting vertically about 1½ inches, through which the sand is thrown by the action of the centrifugal force. Below each machine are arranged two chambers and a hinged trap door can be thrown in such a position that the sand goes either to the right or to the left, in one or the other of the two. In this way six different kinds of sand can be mixed and stored away. On the ground floor each chamber has a door at a convenient height to let the sand out on wheelbarrows or on cars for distribution around the foundry. These three centrifugal sand mixers make at present about 1,500 cubic feet of sand per day, though the capacity of the machine is very much more. All the machinery in this department is driven with an electric motor.

FIG. 20—CONVEYOR FOR SAND—FLEURY SAND MIXERS.

The heating in both foundry buildings is done on a plan similar to the Sturtevant system, i. e., fresh air is drawn by a fan through a space filled with steam coils and discharged into the building. With the help of a shutter in the suction channel it is possible on very cold winter mornings to draw the air from the outside. This is quite feasible in view of the fact that early in the morning the air inside the building is comparatively pure. In summer the fan is kept going to take in fresh air and keep the place cool.

Before closing, a few more remarks of a general character ought to be made about various matters connected with this establishment. Test bars of every heat are made, as is usual in some of the foundries of the States. They generally only make them when trying a new mixture. In such a case they use bars 1¼ inches square for making a transverse test. It is claimed that too small a bar, as for instance, a ½ inch square bar, shows results that do not exactly tally with the actual conditions. The writer further saw a machine for making drop tests, for which bars 1 9-16 inches square are used, to find out how the iron behaves under a heavy blow. This, of course, only gives comparative results, and no actual figure can be derived from it. Two angle or channel irons form a guide for a weight which can be raised to a height of 5 feet 9 inches or any distance below that. It weighs 26½ lbs., and is released from the rope by an arrangement similar to the usual drop. The test bars are laid on two knife edges 6¼ inches apart. A scale painted on the outside of the frame shows the height to which the weight is raised. The base is a solid cast iron block that weighs something over 1,700 lbs.

The concern has its own reservoir on top of a nearby hill, where water is pumped from a well in the shop, about 70 feet deep. The water pressure, due to the high location of the reservoir, is between 90 and 105 lbs. per square inch. For the city water, which is used for drinking purposes only, a tax of one cent for every 12 cubic feet has to be paid. It should further be mentioned that the concern has built near the shops a house containing large reading and dining rooms, fifty shower baths, two bathtubs and an office for a doctor where any employe can get medical advice free of charge any day during certain hours.

The principal work that the concern turns out of its machine shop are steam engines, ice machinery, lake boats, steam boilers and heating plants. Considering the unfavorable position of Switzerland, hundreds of miles distant from the nearest coal and iron mines, and still further from the nearest seaport, and surrounded by large powers that all follow to a certain extent a protective policy, this shop certainly stands as a shining example of what can be accomplished with push, energy and hard work.

Metallurgy and Secrecy.

In the April issue of THE FOUNDRY we noted some claims made by the Bellaire Edge Tool Co., of Bellaire, Ohio, for their process, which was intended to mark a new era. In commenting upon the claims of this concern we said at the time, that somebody was evidently trying to rope suckers into their net, but judging from the following paragraph, taken from the daily papers of that neighborhood, the catch has not been large enough to pay expenses:

"The Bellaire Edge Tool Company, of Bellaire, Ohio, have made an assignment to Geo. B. Moore, attorney. The concern were engaged in the manufacture of edge tools direct from pig iron by a secret process."

Once, and for all, whenever there is any secrecy connected with a metallurgical operation it is safe to keep your hand on your money. When someone approaches you with a secret scheme that is going to revolutionize the present system of manufacturing iron and steel, don't invest in it until its promoter can give you a common sense explanation of its workings. The Bessemer Process ranks among the greatest discoveries of the age, and yet no one will claim any secrecy for it. It is the same with other methods, the results produced can be accounted for in an intelligent manner. But not so with the metallurgical bunko-steerers, who travel through the country, adding a little steel scrap to your mixture of cast iron, and then cross themselves as if they thereby invoked the aid of a supernatural power. They are frauds of the first magnitude, and must rely on superstitious foundrymen for a livelihood.

It is a safe practice to let all metallurgists alone, who claim to produce results that cannot be accounted for.

What if He Should Die.

The molders at the Gardner Foundry are having a vacation a part of this week, owing to the illness of Mr. Connors, who does the melting.—Gardner (Mass.), News.

Words Fail.

I can not say too much in favor of THE FOUNDRY.

HENRY CROSS.
Philadelphia, Pa.

A TECHNICAL JOURNAL DEVOTED TO FOUNDRY INTERESTS.

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The Western News Company, Chicago, Ill.
The Williamsburg News Co., Brooklyn, E. D., N. Y.
The Wisconsin News Company, Milwaukee, Wis.

Trade Outlook.

In discussing our economic conditions THE FOUNDRY has never advised the foundrymen of the United States to trust to any kind of a tariff bill for amelioration from the injurious influences acting upon the trade. However, in so far as the rest from disturbances to the business world, whether from financial or tariff laws, can increase man's inclination to go to work we welcome any settlement which does away with agitation.

The influence of mind over body is great, and many a concern which has been suffering from imaginary ailments will, we hope, now feel entirely cured, and ready to do what it should have done long ago—some business.

Reports of transactions in iron and steel indicate an increased volume of trade, with a slight advancement in prices. Although rumors of advances in pig iron reach us occasionally, these are followed in a day or two by advices stating that the higher price has not been held. As we said in a former issue, a great many foundries and furnaces are able to make a profit at present terms, and the tendency is to adopt such improvements as will permit a continuation of business on present lines.

The excellent crop prospects at home, coupled with a shortage abroad, is dwelt upon by the different trade reviews as calculated to force an improvement in business. In fact, more faith seems to be pinned to the favorable showing of our resources than to the tariff bill. It recalls a story of Cleveland's first term, and shows, after all, that politics are subordinate to natural conditions and the activity of the people. A Republican hailed a Democrat who was hauling a load of wheat to market with: "You are catching the effects of voting for Cleveland, aren't you?" "I don't know," responded the Democrat, "I am getting ten cents more a bushel than I did when Arthur was in office." "But how much are you getting to the acre?" asked the Republican. "Well, when it comes to that," replied the Democrat, "I must admit that Clevelaand don't let things grow anv too good." It is to be hoped that McKinley will let things grow.

For six months past the sales of certain kinds of iron have heavily exceeded their production, and the furnace men have had

no trouble in maintaining the price of these brands. England, Russia, Germany, Holland, Belgium, France, Italy and Austria are the heaviest purchasers of southern iron, while Spain, Portugal and Turkey are small buyers.

There is not much doubt but that the last half of the year will show an improvement on the first half, as the general conditions are better; stocks are light and prices low. Already we hear of some large contracts having been made by manufacturers of agricultural implements.

Our Anniversary.

With this number THE FOUNDRY begins its sixth year. Comparing it to past numbers, the reader can judge for himself as to the constant improvements which have marked its growth since it first appeared. These improvements have been made so gradually that it is only by comparing it to some of the earlier numbers that our readers of to-day can fully realize the sweeping changes which have been made for the better.

The position of THE FOUNDRY among trade journals is unique, to say the least. It is but a few short years ago that the majority of molders and foundry foremen would ridicule the idea of "book learning" in foundry matters. They reasoned that pounding sand could never be improved upon by any kind of literature. In fact, they rested secure in the belief that they knew it all. The five years' existence of THE FOUNDRY has demonstrated that printer's ink is as much an agency of knowledge on mechanical questions in the foundry as in any other trade, that it is a porous plaster on the dark methods of secrecy.

The man who five years ago had the courage to let his name appear with an article in THE FOUNDRY was generally alluded to as being a "Smart Aleck," and those who made the remarks but little thought that their prophecy was in the main true. By demonstrating that book learning paid and left a large margin for profit, that the man without it was seriously handicapped, even in pounding sand, THE FOUNDRY silenced the ridicule born of ignorance.

THE FOUNDRY has won its present position on a basis of giving first-class value. In other words, the relation existing between itself and its subscribers and advertisers has been made to rest on the broad foundation of business. It has made it a point to secure for them a fair interest on the money they invested. How large this interest has been only individual experience can show, but it may be taken for granted that no one would maintain business relations with it unless it paid him in dollars and cents to do so.

Founded thus on a policy of honest dealing, THE FOUNDRY looks forward without fear, let the future bring what it may.

Two Ways of Looking at it.

The Iron and Coal Trades Review, in an editorial notice, referring to the attempt of those engaged in the engineering industries of Great Britain to obtain an eight-hour workday, says:

"The employers have arranged to lock out 25 per cent of the men employed in the engineering workshops, and the workmen's association has responded by arranging to call out the remaining 75 per cent, so that at the present moment we stand face to face with the prospect of a dispute which threatens to close most of the engineering works in the country, and that, too, at a time when this industry is exceptionally busy. Grave culpability must attach to one side or the other, or to both, if this threatened dispute is permitted to assume the alarming and devastating proportions that are now apparent. The injury which such a struggle would inflict upon our leading industries at the present time would be incalculable. There is a very large amount of work in hand in the shops of manufacturers of all kinds of machinery—mining, textile, agricultural and other; and as the machine shops of Germany, Switzerland and the United States are less fully employed than our own, they would only be too glad to have the opportunity which such a struggle would afford them—the greatest God-send they could have—of profiting at our expense. Surely both employers and employed can see this, and surely, seeing it, they will move heaven and earth to avoid a crisis which can benefit neither, nor anyone concerned, whether as individuals or communities, except our ever-

watchful and sometimes not over-scrupulous rivals.

"Had the State come into court with clean hands, its influence and authority should have been invoked to avert this fatuous and fatal conflict. As it is, one can hardly see how the State can be asked or expected to mediate in a conflict which it has been the chief agent in bringing about. We deliberately charge the government of three years ago with having paved the way for the struggle by conceding the eight-hours day to the men employed at the Royal Arsenal and dockyards. After that fatal step it was inevitable that there should be an attempt made on the part of the workmen in private establishments to obtain the concession made to the government employes. They have sown the wind, and they have now reaped the whirlwind. We trust they are satisfied with the results of their cheap bid for popularity. Meanwhile, every man who has the interest of his country at heart will seek to stem the tide which the State has deliberately let in as a flood."

What strikes us as rather uncommon is the charge that the British government is responsible for the present labor troubles by granting an eight-hour workday to some of those in its employment. The United States government long ago established the eight hour workday in all departments over which it exercised direct control, and yet we have never heard it intimated that it made an error in doing so. We believe on the other hand, that it has actually made a financial gain by the change, as it has been able to secure the pick of mechanics by granting more favorable conditions than individual employers. It would also be well for the Review to bear in mind that industrial supremacy is not in any way dependent upon a long workday. Great Britain has reached her present exalted position with a shorter workday and higher wages than is paid by any of her continental competitors. The pauper labor of Europe has not been able to wrest from her the hold she has upon the markets of the world; nor do we believe that even the eight-hour movement will affect her position in this respect.

Of course, we can understand that with the workshops exceptionally busy, the Review takes a different view of the question from what we do on this side, where industrial establishments do not even average an eight-hour workday, and where employer and employe alike are beginning to agree that a move of this kind would be of ultimate benefit to all concerned. The general increased efficiency of labor having shorter hours is so well established that it becomes a question whether there could possibly result any loss from the adoption of the eight-hour workday.

In strange contrast to the Review's pessimistic utterance that we would regard as a great God-send to have the British engineering industries engaged in a struggle of devastating proportions, is the following editorial from the "Iron Age:"

"The great strike of the Amalgamated Engineers and Machinists in Great Britain should excite no feeling of exultation on this side of the Atlantic. Ordinarily, our competitor's troubles are observed with satisfaction, and the more he is harassed and worried the better we like it. In the present case, however, we are decidedly interested in seeing a speedy settlement of the trouble. It is no small matter to us that the industries of our British cousins are crippled and that their trade operations are paralyzed. While they are our competitors in many respects, yet they are also our customers, and at no time in their history have they been purchasing so heavily from us as in recent months Probably never was Great Britain so prosperous as it has been in the past two or three years. Every manufacturing concern apparently has been running full time and full handed, and no man who desired work was idle. An American engineer who has just made a tour of the shipyards and great manufacturing districts says that everything is 'humming,' that everybody is earning good wages and that every engine he saw was in motion.

"Into this busy scene stalks the labor agitator, with a demand for an eight-hour day. Failing to receive immediate compliance with his wishes he orders a strike, and now thousands of men are idle and other thousands expect to be. The hum of industry is dying away, and in its place will ere long probably be heard the moan of those who are deprived of bread. Thus the change is speedily made from a condition of boundless prosperity to

one of privations and misery. It is a very serious matter from a British standpoint, but it is also serious to us for a double reason. We have needed the British as well as other foreign markets to assist us to recover from our depression by taking our surplus products. These have been taken to a greater extent than ever during the past year. Not only have our agricultural and other comparatively crude products been exported in enormous quantities, but our manufactures have been purchased because they were really needed to help to supply the great demand. Such a demand can only exist when working people are fully employed and when times are generally prosperous. Should the strike continue for any length of time this great market will undoubtedly take less and less of our products, much to our discomfort. We are therefore deeply interested in seeing it speedily settled."

A sober reflection upon what the "Iron Age" says in regard to our interests in the British strike cannot fail to impress the reader with the full force of truth, although we believe it somewhat overdraws the part the walking delegate plays on such occasions. Our contemporary knows that labor, as well as capital, makes all the demands it can consistently enforce. Surely it would not claim that the numberless reductions which have been made in the wages of employes on this side of the Atlantic during the past few years have been due to the effect of walking delegates among the employers. Viewed in its broad sense, the demand for a reduction does not come from the employer, but from a lessened demand for his product at present prices, and on the other hand, a demand for increased remuneration on the part of employes is not caused by the walking delegate, but by an increased demand for what they produce at increased prices, whether this price is increased by an actual advance, or its equal, a reduced cost of production. The demand which is being made by labor on the other side is a claim of the workingmen to share in the benefits of the activity which our British neighbors have lately enjoyed, and good times, not the walking delegate, is the cause.

The Government and Business.

The government, having failed to secure bids upon armor plate within the limit of the price fixed by Congress, is making efforts to secure an appropriation with which to build a plant of its own. As such a move will bring the government in direct competition with individual enterprise, the time is opportune to briefly review the past record it has made as a conductor of industrial works, constructor of public buildings, etc., and the ability it has shown in carrying them on.

Among the large number of enterprises in which the government has engaged it has with but few exceptions made anything but a record of which an individual promoter would feel proud. The length of time consumed in completing a government structure has become proverbial. It is doubtful if the government has executed a single piece of work which in price and quality could compare with individual labor. The cause thereof does not lay far away. Politics have been mixed with the selection of suitable heads for the different departments, and from these to the lower subordinates a political pull has been one of the prime necessities in order to secure a federal position. Politics and business are seldom mated, and the result of such a course could not but be seen in whatever these unnatural partners have undertaken to do.

If the government would select the members of its mechanical departments with the same care as is exercised by corporations, its chance for success would be greatly enhanced. The head of an individual firm who does not manage to have the cost and quality of his product within the range of his competitors will soon be supplanted by someone who can, but not so with our government, where the man who possesses a pull can defy precedents. It is the same whether we enter a government foundry, machine shop, ship yard, public building, etc., the same lack of business and over-supply of politics is everywhere apparent.

The postal service is commonly pointed to as an example of what the government can do. Let us for a moment suppose that this business was placed in the hands of individuals, would there be such anxiety to secure a position? It is the soft snaps which make the majority of government places so

much sought after. It is good pay, short hours and not much to do, that makes these positions preferable. With a sense of business pervading them the soft snaps would disappear, as they do in all places where business is done.

The Carnegie Steel Co. and the Bethlehem Iron Co. may be getting the best of the government in making armor plate, and the government may be able to make it for less than three hundred dollars a ton, but whatever the cost turns out to be, we may be sure it will be above that at which individuals, who do business for business' sake, can produce. The amalgamation of politics and business forms a very weak union which will never be able to outbid or outdo the energies of those who are in the race with nothing in view but business.

Some Changes in the Foundry Business.

The growth of the malleable iron business has been comething marvelous, nor is there any sign that it has anywhere near reached its limit. The reason for its popularity lies in its practicability. It is but little over a decade ago that the greatest part of malleable iron was melted in the cupola; and while some foundries in that manner produced excellent castings, there were many who did not. A slight variation in the metalloids would injure the product of several heats before it could be corrected.

When specifications stipulating that the castings should meet certain requirements began to be made the air furnace rapidly displaced the cupola. The extra cost of melting by this method was more than compensated for in the uniformity of the output. Having demonstrated its superiority, malleable iron began to make great inroads upon grey iron castings, principally in agricultural machinery and car building. It is a strong rival of cast steel, which, in spite of all the claims made for improvements, still seems to possess the element of uncertainty to a large degree. It is used in many places under the name of steel because the populace has a greater regard for the latter material. Nearly every bicycle manufacturer will show you the rough blocks of steel from which he, at great expense, turns out the finished crank-hanger. In view of this it would be interesting to know what becomes of the many thousand of crank-hanger castings our malleable foundries are turning out at a fraction of the cost of steel. We believe that more than one rider of even high grade wheels would be surprised to learn how the art of casting has deceived him.

As the malleable shops undertake larger and more difficult castings, they will also be compelled to employ a better grade of mechanics. Those who are inclined to view with alarm the progress made by this branch of the trade should remember that it does not matter much in what kind of metal the casting is to be made, the skill required in molding it remains practically constant.

* * *

When the steel range and sheet-iron stove first made their appearance they were denounced in language none too soft by the manufacturers of cast-iron stoves. It was condemned as useless, and the prediction made that those who purchased them would quickly return to the cast-iron variety. It is somewhat inconsistent with the prophecy to observe these same stove manufacturers busily engaged in turning out steel ranges themselves. To be sure, they have found out that the public is master of the situation, and secures what it demands; and they have probably also learned that the steel range is holding its own remarkably well; so the result would be either to do less business in cast-iron stoves or to get into the band wagon and manufacture what the public desired.

Individual Responsibility.

When an accident occurs nowadays the first thing to be considered is the amount of damage that can likely be collected. Every shop in the country seems to have men who are bound to get hurt, even if a dozen men were detailed to watch each of them.. One of these, by the name of Charles E. Dyer, has commenced suit against the Economy Foundry Company, of Syracuse, N. Y., for $10,000 damages for the loss of an eye.

The complainant alleges that he was told to fill some holes in certain castings, and that rust in one of them caused the injury. Dyer claims the company should have known this, but looking at the matter with common

sense, we may well ask the question: "Why should he not have looked out for this himself?" There are too many people who never think of using ordinary precaution upon their own part.

Chemical Versus Mechanical Analysis and Chill.

BY DR. R. MOLDENKE.

In the July number of THE FOUNDRY two articles relating to current practice would seem open to further discussion, and possibly to a little kindly intended criticism. Mr. Keep nailing his flag to the one-half inch test bar and the mechanical analysis of foundry mixtures, and Mr. Knight in discussing the question of "Chill."

I thoroughly agree with Mr. Knight in emphasizing the fact that plain and unclouded statements, both as to theory and practice, should be the rule. He will forgive me, therefore, when I call attention to the fact that his excellent articles lose much of their value to the foundryman when a discussion of the subject introduces absolute temperatures, vibration, amplitudes and the C. G. S. system. These higher elements of metallurgic science are even now undergoing modification and changes in the hands of the master minds working from the purely academic standpoint, and can therefore hardly be grasped by the practical foundryman, who may not value the storing up for years of this material in the hopes that dollars and cents may be the final outcome.

In Mr. Knight's discussion of the fusibility of hard and soft irons I note with pleasure that the analyses given bear out the results obtained by Mr. West in his elaborate series of tests, as well as my own few observations, in so far as the percentage of total carbon may affect the result. While it leaves us correct in our general view, it also shows that there is no such thing as an iron-clad statement in foundry matters, and that in no business do the little points play such an important part in obtaining desired results as in this. We can therefore readily accept as a fact that soft iron with 3.43 total carbon melts at a lower temperature than hard iron with only 2.5, as stated. Carrying the matter to its logical conclusion, the reduction of carbon as found in steel and eventually in wrought iron, will at once show this, as their melting points are far beyond that of gray iron.

It is therefore that I suggested to Mr. West at the last meeting of the Pittsburg Foundrymen's Association, the desirability of casting a suitable iron from the same ladle into chills and into sand, thus obtaining white and gray castings side by side, having the same composition in every respect except that in one case the carbon is combined, in the other graphitic.

I would like to see Mr. Knight apply the Le Chatelier pyrometer to such an experiment, as it would open up a discussion of the evident recarburization of the iron with the graphite in the case of the gray pig, while melting, accompanied as it is with an extra absorption of heat beyond that required for liquidation only. This process could then be contrasted to the simple melting of the white pig, where no such extra amount of heat is required. Furthermore, I would like Mr. Knight to describe his method of applying the thermo-couple to the iron, while melting it, so that those interested can judge whether he has obtained the melting point of the iron, or only the temperature of the surrounding furnace gases.

The statement that the greatest chilling effect is obtained when the heat in the molten metal is at a minimum would seem to me open to further discussion, for some investigators have found the opposite to hold true. Furthermore, the statement that no chemical difference has ever been detected between the exterior chilled part and the interior unchilled iron of any casting is at best misleading, for Mr. Knight doubtless intended to say that the radical chemical difference is in the form of the carbon only, being combined in the chilled portion, and graphitic in the gray core.

Turning, now, to the article of Mr. Keep, I must express my astonishment at the tone of that portion which relates to the antagonism to his special method. Possibly I am alone in my views when I hold that there is room for all good things, and that a little common sense charity toward the work of others makes life wonderfully smooth.

As to the value of Mr. Keep's special method, others more competent than I can discuss this with greater benefit to the reader, but

as to the one-half inch test bar, I must say that I think it of value only in obtaining the daily shop record of the work, and then for stove and light plate work alone. My experience is that a test bar should approach in its dimensions, as well as in its physical condition, the work it is intended to represent; so that the whole subject of test bars may by no means be considered as closed, but on the contrary a fit matter for extended trial and discussion.

In reply to Mr. Keep's article I will therefore state what I think should, and very likely will be, the ultimate outcome of the present agitation. There will be a division of foundries and manufacturing plants into two classes. First, those which are too small or financially weak to employ expensive talent, and secondly, those whose standing is such that they require the best trained experts to keep them in the front rank among producers. In the latter case it goes without saying that a combination of chemical and physical research will continue to be the order of the day, but for the smaller firms, it will be as Mr. Keep rightly remarks, a question of money, and I may add, of good judgment.

To my mind, the next twenty years will find a remarkable change in foundry management. The superintendent or manager will be what he should be, an expert in everything connected with his work. He must be able to step into everyone's place, should occasion require it, that is to say, he must be fitted to be foreman, accountant, chemist, etc. While he will never be called upon to assume these places, it will enable him to properly control his working force and output, and in this way establish him as a money-maker for his employers.

Now, such a man, and he is the coming man for the place, can only be one who has acquired a thorough scientific training, not necessarily in a college, by any means, for life itself is a hard master, and the possession of the rare ability required by a good manager will push the man to the front whether he comes from the ranks or the universities.

Taking for granted, then, that the manager of a small foundry is as above described, what is to hinder him from employing a cheap analyst (not chemist), or have one of the office clerks look after the few silicon determinations that may arise daily, and he himself can make up his mixtures while sitting at his office desk. It is not necessary to pile up each car load separately, nor to make a complete analysis of this batch of iron. In handling some twenty thousand tons a year, I have not had more than a dozen complete analyses made, and some of the determinations used in the daily work represent three thousand tons of stacked-up metal. Such is the latitude a mixture should allow.

It strikes me that Mr. Keep's method also costs something to operate, when compared with the chemical, so that the whole question can safely be left to the future for solution, which will inevitably bring about the survival of the fittest.

Stretching the Truth.

In a former issue we called attention to the apparent inclination of the Doherty Process Co., of Ridgway, Pa., to compare the results of its "process" against some evidently bad examples of foundry practice. To be sure, it is so much easier to make a favorable showing when contrasts are only made with the worst practice that can be found, but such comparisons can in no way help to establish a reputation for actual worth. The Doherty Process, melting iron at 1 to 7.5, may appear all right when compared to a foundry melting 1 to 5 or 6, but it stamps itself as being of questionable utility when it is placed alongside of hundreds of American foundries melting above 1 to 8.

In a late number of the "American Manufacturer" some claims are made by the Doherty Iron Castings Process, limited, of London, England, which are entirely at variance with facts. This concern shows the same traits as the other Doherty Process companies, of which it is undoubtedly a first cousin, in making claims. In fact, we fail to see why the word limited should be added to its name, when its claims are considered. It assures us of its ability to deoxidize rust and return it as metallic iron, which cannot help but be of great advantage to all foundrymen (who have enough of rust). In fact, we learn that wherever the "Process" has failed to work, this has been due to the in-

ability of the foundry to furnish enough rust. In quoting the following from the pages of the "American Manufacturer," we expect the reader to furnish his own salt:

"The manner of putting the process into practice is described as follows: After placing the charge of coal or coke in the cupola, the fire is started in the usual way and kept up until thoroughly going in the bed, when the tuyeres are closed and the consumption of fuel delayed until the wind blast is turned on. The temperature of the furnace then rapidly rises, and when the iron commences to melt, the steam jets are opened and the combined air and steam blown through the fuel and iron. The amount of steam must be regulated so as to produce the hydrogen cast of flame, which can be seen at the charge hole of the cupola. The combined air and steam produce an intense heat, and the decomposed steam acts as a powerful deoxidizing agency, and that portion of the iron in the charge which is oxidized or rusted becomes deoxidized and resmelted into metallic iron of a more strict form. By the Doherty process it is claimed that the impurities usually found in iron are, to a large extent, burned out or neutralized, and the resulting cast iron is softer, stronger, and more workable, approaching to the character of mild steel, so that samples of it can be upset or drawn out under the hammer to a limited degree, and castings made from it are more easily machined and filed, and are free from the hard skin usually formed on castings made in the ordinary way. The castings are also said to come out of the molds with a cleaner and finer surface, and less sandburnt than castings made in the ordinary way, and in addition are more uniform and homogeneous, being devoid of hard spots, and therefore free from uneven tension. Not only is a much superior quality of casting produced by this process, but a much larger amount of cast iron is, it is claimed, obtained from a given quantity of iron charged in the cupola than is produced by methods in ordinary use. For example—it has been found experimentally that with a charge consisting of 7,745 pounds of scrap iron and 2,061 pounds of pig iron (making a total charge of 9,806 pounds), there has been run out from a cupola 9,582 pounds of castings, showing only a loss of 224 pounds on the charge. After deducting from that the loss caused by the slopping over from the ladles, the actual loss or shrinkage in the process of melting where this process is used is under 2 per cent of the total charge put into the cupola, as against from 20 per cent to 25 per cent in ordinary foundry practice."

We will only add that, as a rule, better results are obtained in experiments than in practice. To speak the truth, we believe the Doherty Process has always worked better in experiments than anywhere else. We are compelled, by the regard we have for truth, however, to call a halt in the unlimitedness of this London company's, limited, statements. When it compares its 2 per cent loss "against the 20 to 25 per cent loss in ordinary foundries" it is stretching the truth beyond its elastic limits, and we would like it to furnish us with a sworn affidavit of the shop that is losing from 20 to 25 per cent of its iron in melting. Its patent process may do some of the things claimed for it, but if this is so, it will not have to be supported by misstatements like the above, which have every appearance of being made intentionally. The foundrymen may not know as much as they should, but they are not fools, by any means. The very idea of claiming that the ordinary foundry loses 500 pounds out of every ton of iron charged into the cupola is enough to show the author of such a statement to be a full brother to Ananias himself. As we said in a former number of THE FOUNDRY, the Doherty Process is attempting to secure an introduction by comparing itself to extremely bad practice, and when it fails to find practice which is bad enough, it shows no hesitation in manufacturing something to suit. We have but little faith in any Process which resorts to such questionable means in advertising itself.

The Doherty Process may be the most wonderful discovery of the century, but the misrepresentation concerning it casts a serious doubt on the whole business.

Excellent.

A most excellent journal.

UNION IRON WORKS,
Spokane, Wash.

CAST IRON NOTES.

Devoted to inquiries from Practical Foundrymen on the subject of Melting and using Cast Iron. Address all Inquiries to W. J. KEEP, care of The Foundry.

IS PIG IRON WHICH IS MADE IN 1897 AS GOOD FOR FOUNDRY USE AS THAT WHICH WAS MADE A FEW YEARS AGO?

The form of this interrogation indicates that the questioner is of the opinion that it is not. A founder will generally consider iron as not good if it is different from that which he has been accustomed to use.

One reason for a change is that ore from new mines is being used very generally, and that taken from old mines is of a different quality from that which was taken nearer the surface.

The chief reason for a change in the character of pig iron at this time is that the low price of pig iron has led many furnace managers to change their methods so as to get the greatest possible tonnage with the least labor.

To do this the volume and temperature of the blast is greatly increased, and the furnace is driven so fast that one stack is made to yield in some cases twice as much iron in a day as formerly with the same number of men.

It is a question whether in the long run furnaces which intend to make foundry iron will save money by this rapid driving. A furnace which is crowded is likely to produce a less uniform grade of iron.

The change in the character of foundry iron which perplexes the founder is, that iron which from the fracture appears to be of a certain grade is found to contain less carbon and silicon than he has been accustomed to expect in such a grade. In many cases the grading is less uniform than formerly.

The character of a casting is largely determined by the silicon which it contains. The amount of silicon necessary to produce a given softness and grain depends to a great extent upon the amount of carbon which the iron contains.

With less carbon more silicon is needed to produce a given quality. If more of the carbon is combined than formerly, more silicon is necessary.

With the present fast driving the iron produced contains less carbon, and a greater part is combined, and at the same time it contains less silicon than formerly.

Compared with former iron, more silicon is needed to produce a given effect upon the casting.

This silicon must be added by using an iron which contains a large amount of silicon.

The founder does not like to use such an iron because it costs more.

If iron is offered at a very low price and it is necessary to use with it a higher priced iron to get the silicon that the low priced iron lacked, such iron may not be cheap.

For these reasons the iron from furnaces which are run rapidly is not as desirable for foundry use as that from furnaces which are crowded less.

It would help the founder if those who continue to run their furnaces as formerly would advertise their iron as "old process" pig iron.

Many founders have learned to regulate their iron mixture by a measure of shrinkage, which is kept uniform by adding or decreasing silicon.

With low carbon the shrinkage will be higher and additions of silicon will not bring it down.

Those who regulate their mixture by chemical analysis are in a worse plight than those who use mechanical analysis, because they expect a uniform physical structure to accompany a uniform percentage of silicon.

With lower carbon the percentage of silicon must be increased.

If the fast method of running the blast furnace is to be permanent the founder must adjust himself to the new conditions, and before long the iron which troubles him now will be considered good iron.

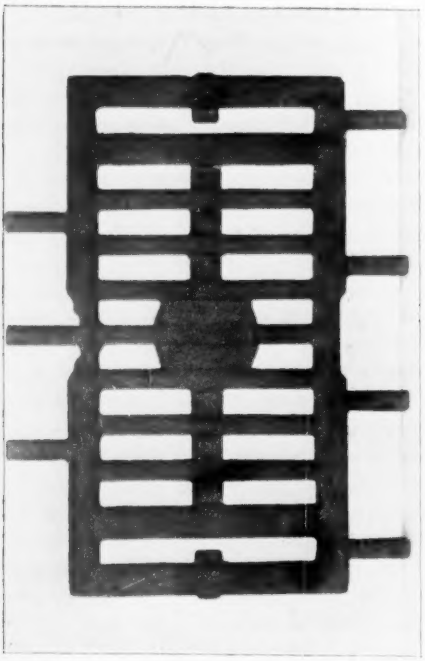
The term pig iron does not represent a given composition, neither does the name No. 2 foundry iron indicate a definite kind of pig iron. Two irons may give the same chemical analysis and yet they will produce castings which have very different physical characteristics. Cast iron is a name given to a vast variety of compounds of iron with carbon and other elements. Each of these compounds are often so changed by conditions attending remelting or cooling or the size of the casting, that it becomes a new compound.

The founder should realize this, but it seems very difficult for him to do so.

A New Core Compound.

The gas-producing ingredients contained in the ordinary materials used for core-making is such as to render the making of delicate cores, without having a blow, something to be attended with a great deal of care. Even with all vents open, something not always easy to secure in light, complicated cores, there remains the danger of the iron finding its way through some crack, and thus making more trouble than if the core contained no vent at all.

We illustrate herewith a core which was used without venting, or rather without being provided with vents, and entirely surrounded by iron. The compound used in making it leaves the sand, when dried, very hard, but porous; in fact, open enough to permit the gases traveling to the prints through the porous channels left by the compound through the sand.



Ordinary core-sand mixtures generally show an inclination to stick to the casting, especially when the casting is light. It is claimed for this compound that it disintegrates the material of which the cores are made, and thus prevents any annoying adhesion. Besides, no blacking is required on cores made with it, as in the process of baking the compound furnishes the cores with a covering superior to any blacking that could be applied.

This compound, which costs very little and goes further than the majority of mixtures used for this purpose, is manufactured by the Holland Linseed Oil Company, 683 Austin avenue, Chicago.

Officers of the Western Foundrymen's Association.

C. A. SERCOMB.

The newly elected president of the Western Foundrymen's Association, Mr. C. A. Sercomb, of Schwab & Sercomb, Milwaukee, Wis., is one of the busiest members of that body.

Mr. Sercomb was born in Milwaukee, his father being a member of the firm of Turton & Sercomb, the pioneer founders and machinists of Wisconsin, in the past known all over the western States. Mr. Sercomb has always been identified with iron interests, and for many years has been the junior member of the firm of Schwab & Sercomb, founders and machinists. He is active in politics, a high Mason, identified with a number of social organizations, and a member of the Grand Army of the Republic.

Besides being president of the Western Foundrymen's Association, Mr. Sercomb is also president of the Western Manufacturers and a director in the National Association of Builders. His popularity extends over a wide area, and his friends are numbered by the thousand.

WM. FERGUSON.

The new vice-president of the Western Foundrymen's Association needs no introduction to the readers of THE FOUNDRY. His interest in all movements looking towards the betterment of the trade in which

his life has been spent is well known.

Mr. Ferguson has gained his knowledge of foundry practice in the hard school of experience. Being born in Glasgow, Scotland, in 1853, he was a journeyman at 16 and, like "Young America," he started to gather experience by working in a great number of shops. He has occupied responsible positions with some of the best known foundries in the country, and is at present with the Gates Iron Works at Chicago.

From Across the Sea.

Highly delighted with your valuable journal.

F. A. WILDER.

Crowmarsh near Wallingford, England.

Western Foundrymen's Association.

The regular monthly meeting of the Western Foundrymen's Association was held Wednesday evening, July 21, 1897, at the Great Northern Hotel, Chicago, Ill. The president, Mr. C. A. Sercomb, occupied the chair.

The following paper, contributed by H. F. Frohman, on "Foundry Facings," was read by the secretary:

FOUNDRY FACINGS.

Something is needed in a foundry that will prevent the sand of the mold from being burned by the molten metal, that will cause the castings to "peel" readily, that will deliver the castings "smooth," from the mold with a "slick" surface and a bright color, something that will neither run nor burn away before the molten metal at the time of the pouring; something that will adhere to the surface of the mold and "part" and "peel" the sand well when the casting is to be shaken out; something of such a nature that it can be smoothed or slicked in the finishing of a mold. This something we term a foundry facing—a material of very refractory nature that will stand any amount of heat (more than the temperature of the molten metal). I fuly understand that all facings are not necessarily to be slicked. Some facings are only to be dusted on the mold, but I am now speaking generally of the requirements of a good facing. The something that will do all this is carbon (in some chemical form or other), of a very refractory nature, that will stand any amount of heat. Before I proceed, please understand me that facings are not cures of all evils and ills in a foundry, for good sands as well as good molders and the use of good common sense are as essential as good facings and blackings. These latter merely assist the former.

The most common facing (which is a misnomer as it should be termed a "mixer") is sea coal or coal facing. This is used in almost every foundry. This is the only facing known which is not put on the face of the mold, but is mixed with the sand in the proportions of one part of facing to 10 or 20 parts of sand, according to the size and weight of the casting to be made. This sea coal or crushed coal is mixed with the sand nearest to the surface of the mold, in

order to "rot," or in other words to break up, the particles of sand, so that when the molten metal comes into the mold, in its heated state, it does not fuse the sand to a hard mass similar to glass, but allows the sea coal to burn away and leaves the sand in a separated condition, so that when the casting is cooled off, these particles of sand will separate and drop off. Perhaps I do not make myself as clear in this explanation as I should, but this can be verified by putting a small quantity of silica sand in a heated vat so that the temperature will just about fuse the sand. Notice how it will melt together into a solid mass. Then try the same amount of silica sand with a certain percentage of coal dust. You will then notice it requires twice the amount of time and almost twice the amount of heat to accomplish the same result. There is another reason why sea coal is mixed with the sand. This is to vent the mold and allow the gases to escape. Sea coal facing is made from the very best quality of soft or bituminous coal, containing neither slate nor phosphorus, but high in hydro-carbon gases and volatile matter; and the best gas coal makes the best sea coal facing. As stated previously, this is the only kind of facing that is mixed with the sand. All the others are either dusted on the mold or applied with the hand or brush, used wet or dry as the class of work requires. Not only is sea coal necessary to produce a good and sound casting, but a facing or blacking is needed that will close up the pores of sand on the face of the mold so as to produce a smooth surface, and also to a certain extent pave the way so that the molten metal will have an easy glide and at the same time overcome as much resistance as possible and not in any way retard the flow, but on the contrary help it along to find its proper resting place and prevent any of the sand from clinging to the casting after it has been shaken off. The facing must be of high carbon, so as not to burn away, but to remain on the surface of the mold and act as the separator between iron and sand. The best grade of separator (if we are allowed to use that name) is what we term plumbago, silver lead or graphite. These three names mean essentially one and the same thing. Strange as it may seem to the enlightened citizens of this country, a great ignorance exists as to the nature and uses of this material. While speaking of this I desire to correct the rumor that it is dangerous to inhale plumbago or black lead, as it is commonly known. It is not a lead but a carbon almost pure, or a pure coal, the diamond being its most perfect specimen in the crystalized state.

Probably the best grade of plumbago in its crude state is found in the Island of Ceylon, among the East India Islands. A fair quality is also found in New York State; but the greater part of the facings used in this country are made from the Ceylon grade. The crude plumbago is mined and carried from the mines in its crude state by natives in baskets to above the ground; here it is separated, the lumps in one pile, chips and dust in another. It is then put up in large barrels or hogsheads and sent to this country in sailing vessels as ballast. The manufacturers receiving it in this manner, refine, reduce, pulverize and mix it to suit the various classes of work for which it is intended. This Ceylon plumbago being purer, richer, of a more particular nature, is best adapted for facing purposes. Unlike any other carbon or even graphite used for foundry purposes, a pure and good grade of plumbago can be used for almost any kind of molding, such as dusting, putting on the mold with a brush, in dry sand or green sand work, or for core wash, either painting the cores or dipping them. This is probably the best facing to use and the foundrymen and molders are realizing this generally. In former years pounds were used while we might say tons are consumed at present. A pure plumbago is not affected by heat, cold or acid, and, on account of its greasy nature, acts as a sort of lubricator in the mold, helping the iron to find its proper resting place. In making stove plate castings or other light work which is very thin, an extremely smooth surface is required. Two facings are necessary for the finishing of a mold. A first or heavy facing to fill up the pores of the sand and a second or light facing to make a good print or impression on the surface of the mold and at the same time to prevent the heavy or first facing sticking to the pattern (thereby saving the mold from being disturbed), to assist in peeling the casting and lastly to give the cast-

ing its proper color. You will understand that stove plate castings are made so light and thin nowadays that any defect in molding could be easily seen, and therefore would make the castings useless for the purpose intended. Other castings might be plugged or filled, but stove plate castings cannot. The heavy facing used in stove plate molding is usually made from an extremely heavy carbon or graphite, while the light facing is a combination of charcoal and coke, etc., or lighter carbons. The heavy facing is to withstand the heat of the iron, while the lighter prevents the former from curling up or running before the iron and also prevents the mold from being disturbed and also gives the casting the desired color.

Besides the foregoing there are a number of different kinds of facings for different kinds of work, such as soap-stone facing (which, by the way, is the only facing known, not of a dark color). This soap-stone is used for hollow ware and other light castings and is also used by foundrymen generally to mix with plumbago in order to cheapen it. In feeling, soap-stone is of a greasy nature similar to plumbago, but soap-stone cannot be used to any advantage by itself, but is applicable for general work if mixed with blackings. Soap-stone facing used on the mold produces a light colored casting with the appearance of having been whitewashed.

In former years before the foundrymen used such quantities of imported plumbago, a certain Rhode Island facing was the standby and was supposed to be the cure of all evils in the foundry. It was used considerably then for all classes of work, but it has been supplanted by something better. Its nature was similar to plumbago, but not nearly as rich or pure. Its greatest drawback was that it was too "sticky" and that it would not "slick." But as the facing business has advanced, this Rhode Island facing has become a thing of the past and is now succeeded by those of higher grade and qualities.

Mineral facing, X, XX, XXX, XXXX, and as many more X's as you want to add, is made from a graphite coal and is used on general work in a foundry when a particularly smooth surface is not required, merely dusted on to save the casting-cleaner labor. This mineral facing in its different forms is used in car wheel foundries where it is essential and a good mineral facing is necessary. At the present prices ruling for car wheels and general car castings, foundrymen advise us that they cannot purchase as expensive blacking for this purpose as they could formerly, so it has been left to the facing manufacturers to produce a mineral facing at a minimum cost that can be dusted on the mold (not necessary to be "slicked"), that will prevent the iron from cutting into the sand, that will not affect the chill in any way, that will not burn away but bring out the casting free from the sand when shaken out.

There are many more different kinds of facings and blackings for the different kinds of work, and each and every manufacturer classes them according to his notion and pocketbook, but I have mentioned the principal ones, probably with the exception of pipe-blacking. This requires a special blacking containing no impurities whatsoever, and extremely rich in carbon. In putting cast iron pipes to a hydraulic test impure or inferior blacking will show its results more than in any other class of iron founding. The blacking used in pipe foundries is subjected to a chemical analysis before its acceptance for this purpose.

Under foundry facings we might embrace blackings for dry sand work, but as that is almost a separate study of the business, I would prefer leaving it to some future time for discussion. However, I will refer to this class in a few words. For dry sand work, as well as painting cores, about the same ingredients are used as for dusting, only mixed in a different manner and such other ingredients added as will not dissolve in water but assimilate with it very easily. In mixing a blacking for a wash it should be mixed very carefully and worked just as our mothers made up their dough in making bread. Add a little blacking, then water, then blacking, then water, until you have secured the consistency wanted. If this blacking is so mixed it will be found to give much better satisfaction and at the same time save the molder and the casting-cleaner much annoyance.

Facings and blackings should always be kept in a dry place. As a rule they absorb more or less dampness and if they are damp they cause any amount of unnecessary trou-

ble to molders, the result of which no doubt all of you have experienced. I have noticed time and again that if a casting is lost, first the facing is blamed, then the sand, etc., but never the molder. For the benefit of foundrymen in general, I desire to state that a facing and blacking will always shows its defect in ways that can easily be traced. If of poor quality it will run or burn away, when the molten metal comes in the mold. If too much used it will wash or run before the iron and allow the molten metal to cut deep into the sand, or if the metal is poured too hot the blacking is liable to curl up and slide into one corner of the mold. Too much sea coal used in the sand will show a mapped casting; not enough used will allow the sand to cling to the mold. Without going into the details of manufacturing these facings or their special uses, I trust I have interested you. It is an interesting and immense subject to us.

DISCUSSION.

Mr. Carver: There is a gentleman here who makes, I believe, the best castings that are made in the northwest, and I would like to hear from him and have him tell us what kind of facings he uses and how it is he gets such good stove plate castings. The gentleman is Mr. Moore, of the Joliet Stove Works.

Mr. Moore: The orator rather embarrasses me with compliments. I wish I could believe all he says, as I hope he does. I think that he rather overestimates the quality of work that we turn out, and I can assure you that what we do not know about the facing matter would be a very long story. The facings that are used in stove foundries now are generally plumbago and what are known as "heavy facings," the composition of which I really do not know. The writer of the paper could have told a great many things in that connection that he knows and I do not. It is a mistake, however, to say that the best stove castings are made with plumbago. The best stove plate castings are made in this country east of the Hudson river, and it has been so for a generation or two, and there is not very much change. The heavy facing that is used in New England foundries is German lead, and that is used in very small quantities in the west. The difficulty is in the use of it, and it seems to take an educated lot of workmen to manipulate it. The New England molders have been brought up to use German lead and they do use it, and they make the best castings that are made in this country. They also use some Rhode Island lead. The great difficulty in using those facings where the molders have not been brought up to use them is their stickiness. We treat different castings differently. We use some Rhode Island lead; we use some plumbago; and we find that fine charcoal makes very satisfactory returns on most of the heavy facings. We also use considerable soap-stone.

Stove plate castings are made better than machinery castings, not because the foundry is better than the machinery foundry, but because all of the surrounding circumstances permit it. The sand that is used, the skill of the workmen and the various conditions that surround the work.

I would be very glad to answer any questions in detail, so far as I am able, as to how good castings are made so far as we know how to make them. We think our castings are subject to great improvement. That is our judgment, and we would like to learn how to make them better.

It is true that a great deal more plumbago is used on stove plates than was the case five and ten years ago, and for some kinds of plate it answers the purpose better than anything else. We meet with some conditions in stove plate casting that are not met with in other castings. One is the flat gate and the difficulty of preventing cutting underneath. It takes a good sand and good molding, etc., to prevent it. I wish I could give you more detailed information as to how it is done.

Mr. Carver: Mr. Moore speaks of using a heavy facing and topping off with a lighter. What does he mean by a heavy facing? Sea coal? And what does he mean by the lighter facing?

Mr. Moore: We do not use sea coal facings at all on stove plate. The heavy facing is either a mineral, which is sometimes an anthracite, or a combination of black lead and other things that are hardly rated in the paper. Each facing manufacturer has his own brand of heavy stove plate facing. That is the first facing that is shaken on and the return facing is a facing of charcoal and other material or charcoal alone put over the heavy facing for the purpose of permitting the printing back of the pattern. Without

charcoal the pattern would pick up the sand from the mold. But the castings are not all made the same way. In fact, I think if one were to walk through a stove shop and see the various practices in which facing is used and ask either the molders or the foreman to tell him why those things are done, he would be unable to get a satisfactory answer. One molder gets the desired result working one way, and another another way.

Mr. Truesdale: I take the ground that all facings are bad. There is no such thing as a good facing. The coming foundryman will not use facings as we use them now. I am making castings for bath tubs and have been for years without a grain of facing of any kind, and I am making better castings than I find where they are using plumbago. I do it by the use of silica sand. The time is coming when facing men will have to get into some other kind of business. I have had a good deal of experience in using facings and there is so much difficulty in training men to use them properly with any degree of judgment. A molder comes into the shop some damp, rainy morning and turns his pattern, and it sticks. It is all the fault of the facing, in his opinion. It never occurs to him that the conditions are different. When I first came to Chicago I found them using facings on bath tubs. The men are not used to facings, and bath tubs have to have a nice enamel. I watched these fellows, who were almost all machinery molders and not accustomed to the nice use of facings. They stuck it on with trowels. There were forty places where the facing was rough. The facing was good, but it was not properly handled. I have abandoned the use of facings completely, and am now making better castings. I have made better work without facings than I made with them.

Mr. Ott: I have had some little experience in the use of facings. I have had my ups and downs. I feel the same as Mr. Truesdale and I hope the time is coming when we can do without facings. I think the fault is in the molder more than in the facing. I have not had much experience in stove plate castings. I have worked in stove plate shops but not in connection with facing.

Mr. Rowlands: I can say that I have seen many times when I was very glad to have a facing. If I want to use a pattern with a real nice figure I never put on a facing. I take charcoal and shake it on the pattern. I never use a facing afterward. My attention was called to that in Dubuque, Ia. We made some of the finest light castings I ever saw in my life. All they use in the world there is to shake a little coarse charcoal on the face of the pattern. They also use it in the place of parting sand in the mold. With the kind of work they have they do not require over fifteen minutes to finish a mold, which by this method is nice, bright and sharp. I think it is a good deal of a farce to use high priced facings.

Mr. Truesdale: I am accustomed to making light castings. I did not mean that the time was coming when we could make castings of twenty tons without facing. I was speaking of light castings.

Another difficulty in the use of facing is, you get the best grade of facing—what is known as Rhode Island facing—and put it in the facing box. Some fellow does not grease his pattern and it sticks. He conceives the idea of putting some return facing in with the heavy facing, or if he happens to have any soapstone around he puts in soapstone. Bill sees Jim and he thinks it is a good thing, and Tom puts in a little more, and the first thing you know you have a mixture. You cannot catch them at it, either.

Mr. Ferguson: I think the good and bad facing depends upon the manipulation of it. I can remember when we did not have a great variety of facings for the different kinds of work, and we had to use blacking. I must say that I have seen as beautiful castings made in loam with charcoal as I have with any other kind of facing. I cannot conceive of the time when we will make castings without the use of facings. It may be that we will be able to get material that will answer the purpose. It would be a blessing if we could. The great trouble is with the mechanics that have to use it. They will use it 1 to 12 when they should use it 1 to 8. They do not use any judgment. One molder will bring out a fine piece of work and the one beside him will bring out a piece that you do not like to look at.

On motion, duly made and carried, the association extended a vote of thanks to Mr. Frohman for his most excellent paper.

Mr. James Frake, as chairman of the Committee on Apprentices, then submitted a report giving the legal form of indenture, which it would be advisable to adopt. On motion the report was agreed to.

The Secretary read an invitation from the foundrymen of Cincinnati inviting the Western Foundrymen's Association to hold its October meeting in that city.

On motion, duly seconded, the invitation was accepted and it was left to the Executive Committee to arrange the plans, after which the meeting adjourned.

Strength Tests and Analysis of Typical American Irons, with a Resume of Methods for Regulating Mixtures.

By THOS. D. WEST.

A study of the strength tests found in table below prove that where we refer to cast iron we must recognize it as a metal that can be mixed to vary in its strength from 1,400 lbs. to 3,600 lbs. transverse, when tested as mentioned further on, and from 7,000 lbs. to 37,000 lbs. tensile, and which can very often go lower or higher than that shown.

One great difficulty which has existed in obtaining true knowledge of the physical properiies of cast iron lies in the experimenter of the past being ignorant of the great physical difference to be found in mixtures or irons which different classes of work exact.

Men have conducted elaborate and costly researches in one brand or specialties of iron, published them to the world, and then wonder why some other fellow's findings did not agree with theirs. It is not much over two years ago that one of our leading engineering societies accepted a paper exhibiting tests and charts of one class of iron with the view of obtaining from such a coeficient that engineers could accept to obtain the strength per square inch of machinery or structural cast iron work.

The writer was in attendance at this meeting, and there explained the errors of such proceedings, with the result of causing the presenter of the above paper to straightaway collect tests from the actual mixture used in various specialties of founding.

The writer claims the credit of being the first to properly conduct experiments to obtain true knowledge on the strength properties of cast iron, and which was largely inaugurated by the paper he presented before the Western Foundrymen's Association October 24, 1894. If there are any that can dispute this claim, the writer would be much pleased to hear from them, as he is far from wishing to be honored with any creditable work that does not justly belong to him.

The above table, which is a summary of the strength and analysis obtained from a series of about 100 tests taken with bars 1⅛ inches diameter, 12 inches between supports, cast from the actual mixtures used by some of our most prominent founders, which the

TABLE I.

STRENGTH TESTS AND CHEMICAL ANALYSIS OF SPECIALTY MIXTURES.

Specialties of mixtures.	Transverse strength per square inch.	Tensile strength per square inch.	Chemical analysis. Combined carbon.	Graphitic carbon.	Silicon.	Sulphur.	Phos.	Mang.
Gun metal	3,686	37,110	1.130	2.050	1.19	.055	.408	.420
Chill roll	2,980	30,100	1.380	1.620	.71	.058	.543	.390
Heavy machinery	2.791	28,676	.330	2 650	1.05	.110	.543	.350
Car wheel	2,615	23,270	.920	2.550	.86	.127	.348	.490
Light machinery	2.115	21,120	.430	2.500	1.83	.078	.504	.310
Stove plate	1,813	17,750	.350	2.950	2.59	.072	.622	.370
Sash weight	1.480	7,125	2.940	.150	.18	.138	.094	.350

writer secured for "Metallurgy of Cast Iron," will illustrate one plan experimenters and writers should adopt to demonstrate what cast iron is, and what may be expected of it in according different strengths to be derived from the various specialties in founding. The tests shown in Table 1 are from bars of an area similar to square bars having a section of one square inch, and, among other things, will show to the world the excellency of American iron and the wide range the designer, engineer or founder has at command to construct iron castings of most every conceivable character.

In order that all may know the chemical composition of and be afforded an opportunity to duplicate the above grades or mixtures of iron, the writer appends the complete analysis shown and which were obtained for the writer by the able chemist, Mr. W. A. Barrows, of Sharpsville, Pa. These analyses will also serve as proof to show that Mr. Keep is wrong in claiming, as he did in the July number of THE FOUNDRY, that "a test bar having a section of one square inch, broken transversely, will not indicate the strength of iron having different chemical composition, as well as bars either smaller or larger than one inch." The writer admits the above size of 1⅛ inch diameter bars is not as good to indicate degrees in the strength of cast iron as bars of larger area, or cross section, but takes decided exception to the statement that smaller bars than shown above, in table 1, would be better to indicate the true strength of cast iron.

When the writer collected the above tests of 1⅛ inch rough round bars, he also obtained a set of comparative records of ½ inch square bars, which were cast in the same mold and out of the same ladle as were the 1⅛ inch round bars, and tested under exactly the same conditions as the others. The strength record of the ½-inch bars is shown below in Table 2. The writer would state that all these tests were conducted by competent men and before witnesses, and that the bars recorded are all of solid fracture.

It requires very little study of Table 2 to perceive that ½ inch bars or those less than of one square inch section, are unsuited or too small to test cast iron, with any assurance of their records indicating strengths to agree with actual conditions or bear a relation to the chemical composition of the iron. What grounds Mr. Keep has to support his claim that a "one square inch bar will not indicate

TABLE 2.

TRANSVERSE TESTS OF ½-INCH SQUARE BARS.

	Pounds.
Gun metal	398
Chill roll	265
Heavy machinery	395
Car wheel	277
Light machinery	454
Stove plate	160
Sash weight	167

the transverse strength of iron as well as those smaller than an inch," the writer cannot discern, and is sure there are others than himself that would take a deep interest in studying any logic Mr. Keep might advance to prove such a condition to be correct. The writer's grounds for asserting that a one square inch area bar (round or square) is as small as should be used and can record degrees in strength to conform with the chemical composition of iron, etc., is founded on his claim, that small bodies of metal can have their physical qualities erratically affected by the nature and dampness of green sand molds, also degrees in the fluidity of metal when poured, to a much greater degree than larger ones, and in all his experience he never found a case where this principle did not hold good in being uniformly effective as thickness gradually verged from that of stove plate up to castings a foot thick or over. Mr. Keep's assertion that "bars having a section of one square inch will not indicate the strength of iron as well as bars either smaller or larger than one inch," when contrasted with the above, implies that it is wrong for us to expect gradual increase in thickness of castings to have their physical qualities uniformly affected by the chilling qualities of the mold walls and fluidity of metal, were it possible to have uniformity in each element, but that, instead of this, we are to find that there is a certain thickness which the variable chilling qualities of the mold walls and degrees in the fluidity of metal does not affect, and that all below and above this are affected or

vice versa. If Mr. Keep can prove this to be a fact, he will then have sustained his assertion that a bar having a section of one square inch will not indicate the strength of iron as well as smaller bars, but not until then. Is Mr. Keep laboring to disguise the inability of ½ inch bars to test cast iron, or can he prove his statement that they are better than square or round bars of one square inch area? I have shown tests in Table 1 which prove that a one square inch area bar will indicate degrees in the strength of cast iron, and if with any other series of specialties tests they would not, such is only evidence that they are too small and that bars of larger area should be used.

All founders and engineers should labor to the end of inaugurating a standard system of tests, and for which the writer advocates round bars having areas equal to one, two and three square inches, the latter two being for use in hard or chilled grades and the former in soft iron. It costs no more to adopt a bar which will indicate degrees in the strength of iron, to agree with its chemical composition, etc., than bars that cannot do so. The advocacy of any bar that cannot or is unsuited to indicate degrees in the strength of cast iron, as it is displayed in the several specialties seen in Table 1, is only deterring advancement and making it more difficult for the attainment of standards or the possibility of founders and engineers making any intelligent comparison of their own tests with that of others. Bars much smaller than of one square inch section or area are too radically affected by the slightest variation in the dampness of molding sands and degrees in the fluidity of metal, to permit of any confidence being placed in any published records of their tests. Where light or stove plate founders possess a very careful test flask molder, they may if they want to be dead to the world in being able to make comparisons with others, and indifferent to whether they adopt the best method or not, use bars smaller than of one square inch area. Where is the sense of adhering to such small bars, when larger ones have every quality to recommend their use in preference to the one-half bars, and practically cost no more to adopt them?

It is claimed by Mr. Keep that very little has been added to our knowledge of cast iron by tests made with bars of one square inch section, and he implies that the half inch bar has done much. The writer has proven by means of one square inch area test bars, among other things, that the down side of flat cast test bars is stronger than the cope side. Second, that specific gravity of molten metal in solidifying does not affect bars cast on end, or vertical poured work. Third, that "hot" poured metal will chill deeper than "dull iron." Fourth, that degrees in the strength of cast iron can be obtained to closely approximate what the chemical composition of iron, etc., would indicate should exist. Fifth, that a round bar of the same area as a one square inch bar will indicate the greater strength. Sixth, that a round bar excels a square one in presenting a uniform grain and less internal strain, thus causing it to be the best form for a test specimen that can be adopted. Seventh, that a test specimen cannot define by its contraction, etc., how much silicon or other one metalloid iron contains, but to learn such chemical analyses are necessary. Eighth, that iron will absorb sulphur to such an extent as to give the founder need to fear its influence in making mixtures of iron, etc. Something which Mr. Keep claims to have labored six years to discover by experimenting with ½ inch bars, but in the end presented a long paper to the American Institute of Mining Engineers at Chicago, in 1893, to the purpose of proving that iron would not absorb sulphur, and to show the founder that he had no need to fear its influence in making mixtures of iron, etc.

The writer could continue to no end in showing what true knowledge bars of one square inch section or area had expounded for the engineer and founder. Mr. Keep was largely deceived in his sulphur experiments by reason of using a one-half bar. Had he used a bar of larger area, such as could not be erratically affected by the chilling qualities of a green sand mold, and variations in the fluidity of metal, he would have found that iron would absorb sulphur to affect its physical qualities and give cause for the founder to fear its influence in regulating and making mixtures of iron. The writer does not know of one single correct thing that a one-half inch bar has proven, and further does

not know of a single mechanical engineer who will be guided by it or embodies any call for its use in their specifications, and again, a travel throughout the world or this country alone would show that individuals desiring to obtain any knowledge of cast iron, either as an aid to regulate mixture or to learn of the physical properties of the iron that had gone into the casting, are almost to a man (when the total number of founders are considered) using bars or one square inch area or larger. The writer believes that a study of these last two paragraphs will prove that Mr. Keep is wrong in claiming that one square inch area bars have not nor are at present advancing any knowledge of cast iron, and that the general foundry world will indorse and applaud the writer's defense of the one square inch area test bars as being better suited than any of smaller area to make comparative tests in the physical properties of cast iron, as it is generally used throughout the world.

There is much that might be said about the attack Mr. Keep makes on the value of chemistry to the founder, its excessive cost, etc., in regulating mixtures, and that the test bar can be utilized to serve the same end much cheaper. This whole Journal could be filled in clearing up Mr. Keep's statements and showing the wrong position which he takes on the utility and value of chemistry and the test bar. His logic is one that locks the stable after the horse is stolen. We should know what our irons are before they are charged and not afterwards. Before the days of chemistry there was but one way to obtain this information, and that was by melting samples of each car or "cast" of iron in a small cupola to be run into test bars or chill blocks. Mr. Keep's plan of operation may be used by the founder that does not have to melt over three tons at a "heat," that has sufficient margin of profit in his castings to experiment with the first three tons to learn what the balance of a car or "cast" of iron might be, but how about the founders that melt from ten up to two hundred tons per "heat?" Mr. Keep's plans are a back number and impractical in these days of close margins. He does not even admit in his article that the founder should exact a chemical analysis from the blast furnace of the iron they ship, and that a founder taking his chances on following such would in the end be far better off than waiting for the test bar to inform him what the iron was. No, with Mr. Keep there is not anything like the test bar. It is too bad that at this stage of our progress in utilizing chemistry anyone should be called upon to waste their time in its defense. The value of the test bar is not to be ignored when used as a medium to record the physical properties of iron or to learn what has been obtained from a mixture for future comparison with analysis, but to think of ignoring chemistry and being wholly guided by the test bar to denote how mixtures should be made in order to obtain desired results is simply absurd. If the writer was forced to accept one or the other as a medium to regulate his mixtures, the test bar would be the one to go, as he would then know what his irons were before they were charged and to learn what had been obtained in the casting (if he were not permitted to take an analysis) every "gate" or a few swipes of a hammer on a chisel to chip some "fin" or lump of a few castings would soon tell him or any experienced founder or physical tester. There are very few shops that most every casting they make is not to a great degree a test bar within itself, so that unless a test bar is utilized intelligently for comparative purposes their use is but a waste of time and money.

Mr. Keep has much to say about the great cost of supporting a laboratory and would lead the inexperienced to believe that his method involved no risk and cost little or nothing compared to chemical analysis, claiming the latter would cost a founder about $2,500 a year.

There are plenty of chemists willing to be employed by founders, that where there was not sufficient work to engage all of their time at analysis would do other labor to keep themselves steadily employed. Such chemists can be engaged from $60 to $80 per month and could be made to prove the most valuable man around the foundry. As the writer is surrounded with chemists and is daily noting their workings, he should be in a position to know something of costs, etc., to maintain a laboratory. For nine-tenths of all ordinary foundry mixtures silicon and sulphur determination are all that are necessary and both these any chemist can secure in forty-five minutes, with a cost to not exceed twen-

ty cents for material. Instead of allowing only forty-five minutes for the above work we will grant or concede two hours for such labor, which deducted from nine hours per day, leave a balance of seven hours for the chemist to be employed at other labor, such as bookkeeper, timekeeper, or shipping clerk, etc. The above number of determinations are to be understood as being that required for the founder that will not exceed twenty tons per "heat," or one car of iron daily, and by figuring anyone will readily see that it need not cost a founder for chemist's time, material, breakage and all, over $250 per year, an amount that such founders could easily lose in bad castings at one "heat" by following Mr. Keep's plan of waiting until the test bar had proven whether the iron which had been charged was mixed right or not. Of course, for every additional car of iron per day a founder might use, the above expense would be doubled, so that for the founder melting eighty tons per day, the total cost would amount to $1,100 per year, quite a contrast to Mr. Keep's figures of $2,500, which he implies it would cost any founder, no matter how small his "heats."

When drillings are obtained for analysis, they are generally secured from pigs taken from different sections in the two ends and middle of a car, or "cast" of iron, and if a whole car or "cast" is melted at one "heat," it is but just that we concede the same care and exactness to one as we do to the other, and hence as we took samples from the middle and ends of the car or "cast" of iron, before it was charged into the cupola, we should then in remelting the car or "cast" of iron take three sets of test bars from a "heat," providing all one mixture is used throughout the "heat," one set at the beginning, another at the middle and the last nearing the end of the heat, which, though should it be a "heat" to take several "grades" of iron or mixtures out at one "heat," then we would to test all of them, often require to cast 4 to 10 sets of test bars. Now Mr. Keep would have us believe that to mold, pour, clean, test and record 3 or more sets of test bars takes no time in comparison to that necessary for the chemist, (who locks our stable before the horse is stolen), to make analyses. The writer's observation on this point is to the effect that it would take longer for the founder or physical tester to mold, pour, clean, test and record the making of three sets of test bars, than it does the chemist to get his three sets of drillings and make determination of the silicon and sulphur. The trouble with Mr. Keep's calculation lies in his granting a privilege to the physical tester, he will not do to the chemist. There is no reason why a chemist should loaf around or be prevented from engaging in other employment after he has completed his analysis, any more than the man that conducts the molding, pouring, cleaning, testing and recording of test bar work. When this subject is justly and practically considered, there are few founders, no matter what class of work they may make, if they can but afford about $300 to fit out a laboratory, but that can find themselves well able to support the luxury of having a chemist, and be surprised in the end at the great good and saving in dollars and cents such will insure to them. The above is to be considered as common ground for the founders melting from 10 to 20 tons per day or "heat." For all those exceeding this tonnage the question of dispensing with the chemist or his analysis of iron before it is charged and waiting for the test bar to denote what changes should be made in mixtures, is at our present stage of progress wholly out of the question. As an example, we know that in our business we cannot get any blast furnace that will agree to give us a strictly uniform grade of metal of sufficient tonnage to keep us agoing daily with "heats" ranging from 50 to 70 tons. Every car of iron coming into our yard will vary from 10 to 100 points in silicon and from .010 to .050 in sulphur. Unless we had a two-acre farm for storage and a big margin in our profits to pay for piling and reloading iron, how are we, granting we would take the risk of having one "heat" give all bad castings, to learn what the test bars would define or should be done at the next "heat" to make a proper mixture, ever going to practice the plan Mr. Keep advocates. Any one making a study of this phase of the question will readily see the absurdity of Mr. Keep's doctrine. We would no more think of adopting Mr. Keep's plans than we would think it practical to close up our shop to await the return of old-time prices which permitted a founder to make two or three "bull heats" a week and still make money. We occasionally use phy-

sical tests to learn what we have obtained to be reviewed for future comparison with chemical analysis of the same iron, which can be recorded side by side in a book for that purpose, but such is of no value in annulling the necessity of our taking an analysis ourselves of all irons coming into our yards, so that we may know what it is before it is charged. It is true the blast furnacemen furnish us an analysis with every car they ship, but experience has taught us that it pays a firm to have their own chemist to check them up and that when they follow such a plan they will have no cause to condemn chemistry as not being a commendable and profitable practice to adopt, in preference to any guide the test bar can singly insure in aiding the founder to obtain desired results in making or regulating mixtures of iron.

A person not an old time founder, in reading Mr. Keep's discourse on physical testing, would think he was battling for the inauguration of some new departure in founding. The plan he is advocating was in vogue before either of us saw the workings of a foundry and is in keeping with the claims Mr. Keep makes of his being the first to discover the power of silicon to affect the physical propensities of iron, a quality Dr. Percy called the attention of the metallurgical world to some thirty-five years ago and Mr. Charles Wood, a founder of Middlesborough, England, assisted by Mr. John Stead, practically demonstrated by making tests how silicon affected the shrinkage, contraction and chill of iron, a work which it should be said had its foundation laid in experiments conducted by Prof. Thomas Turner, the extensive publication of which is really responsible for the universal recognition of silicon's power to affect the physical properties of cast iron.

The Plumbago Club.

At the last session of the Plumbago Club, the president, J. D. Smith, said that he had profitted by his last experience in conducting the meetings of the club, and had therefore provided himself with a small electrical appliance, which to all outward appearances looked like a mariner's compass, but instead of the usual designation of the points, there appeared the words, "Ambulance, Doctor, Coroner, Messenger, Fire, Police, Undertaker and Refreshments. He explained the way the device operated, as he said in case of his demise it would be necessary to take prompt action to prevent pandemonium. By simply turning the indicator to any of the above named points, the members of the club could have their choice. The apparatus had been carefully tested and was guaranteed to withstand a greater degree of humidity than A. Sorge, Jr., had ever produced in a cupola.

He also stated that he had installed a long distance telephone, and that hereafter members of the club could call it up from almost any part of the country.

When the club was in session, those who were unable to attend could connect themselves with the club 'phone and by the assistance of an ingenious attachment hear all that transpired.

Foundrymen everywhere had been requested to call up and report any infraction of the club's rules or code of ethics on the part of foundry supply men, or if they should act when away from home in a way that was unbecoming.

He insisted that salesmen should always conduct themselves in a courteous, dignified, high-bred manner and that he intended to put a stop to the practice of taking foremen out to see the town in the evening, buying them cheap suits of clothes, champagne and boxes of cigars.

Then again, certain men make a practice of entertaining the young lady typewriters to be found in different parts of the country, and finding out the prices made by their competitors, and this also he intended to have stopped.

Several complaints had already reached him, but he did not consider it fair to ventilate them. Hereafter all would be submitted to the club.

The secretary read the following letter:

Philadelphia, July 5th, '97.

"Secretary of the Plumbago Club:

"Again I am prevented from being with you by an interesting event in my family circle. The occasion I refer to is the christening of my youngest boy, but mindful ever of the loyalty and devotion to myself of the members of our club and inspired only with the thought of evidencing in my humble way my appreciation of the great compliment you have forced upon me, in spite of

my protestations that anything that savored of publicity was entirely distasteful to one of my modest, backward and retiring disposition, I have had him named Plumbago Joseph. The first name is given him in honor of the club so ably presided over by his father, and the second is in my honor. The combination of the two, which I consider is an exceedingly happy one, is an idea of my own, and I feel sure his names will be to him through life a constant inspiration to be worthy of the high ideals they must suggest.

I trust the club may have a pleasant and successful session. May our past record of always striving to inculcate a sacred regard for truth and honor be preserved and may we never permit anyone to join our glorious institution who would indulge in the slightest misrepresentation or cut prices to secure orders that a customer might be inclined to give to another.

You may have noticed that the leading commercial agencies are reporting an improvement in business, but you probably do not know that these reports are furnished the agencies by our company. We were selected as the most representative firm in the United States because of our extensive trade with all parts of America and the fact that we are so closely in touch with manufacturers and consumers on the one hand, and the leading financiers on the other.

"As writing these reports has, as a matter of course, been delegated to me, and the business interests of the entire country and foreign capitalists are largely influenced by these reports, you can appreciate my responsibility, but in the language of Goldsmith:

"'Where'ere I roam, whatever realms I see,
My heart untrammelled fondly turns to thee.'

"Yours as ever,

JOSEPH S. HIBBS.

The reading of the communication provoked a lively discussion, and finally President Smith succeeded in having it considered by sections.

John Hill, as usual, was modestly foremost in the debate. He insisted that it was Hibbs, Jr., that was honored and not the club, in the selection of the name. He was pulled violently into his seat from the rear, though he missed it by about two inches. A resolution was adopted acknowledging the information that the club had a namesake, and expressing the wish that it might become as illustrious as its father. The secretary was instructed to have made to order and forwarded with the club's compliments, a silver spoon, a gold lined cup, a tin rattle, etc.

The fact that one of their presiding officers had been selected to furnish the commercial agencies with reports appeared to some to be a compliment, while others again regarded it as a shrewd scheme to monopolize the bulk of the business in some way, hence that portion of the president's letter was passed in silence.

President Hibbs' remarks, however, about honorable business methods stirred them all up. Secretary Frohman was especially demonstrative ,and coming from one so modest and unsophisticated, it had the effect of increasing the excitement. He took occasion for the hundredth time, to sound the praises of the S. O. Company.

Space forbids a reproduction here of what he said further than that the words "Only, Greatest, Oldest, Best, Largest, Most Reliable, Promptest, Most Liberal, Most Widely Known," etc., were quite conspicuous.

Mr. T. P. Kelly could hardly wait until Mr. Frohman got through to reply. He could not see what any of the advantages claimed for the S. O. Company had to do with the quality of the product. He said the largest men were not always the best, and the small men were not always the worst, and the same rule held good as regards manufacturing establishments. As for himself he valued a good conscience more than a larger volume of business; he had only one price to all alike, and had no respect for the salesman who could only secure an order by cutting somebody else's price. He always talked quality and had followed this policy so persistently and had talked about the quality of his goods so much, that the foundrymen were beginning to believe him, and he had himself more respect for his own products than he had before.

In conclusion he felt that anyone who used or countenanced the use of any other method of securing business than the one of superior merit was dishonest to the custom-

er, himself and his competitors, and he was glad of the opportunity to put himself on record.

Mr. G. A. True secured the consent of the president to address the club briefly. He said that during a series of elaborate experiments on the subject of compressed air he had found that the effect upon a human being of being shut up in an air-tight chamber with the air at a high pressure was most extraordinary and seemed to exhilarate one wonderfully.

He said that he tried it several times on S. T. Johnston and he felt sure that the marvellous results secured at each experiment could be duplicated on a larger scale and supply fun enough for a lifetime.

It was his opinion that under the influence of a certain pressure of air, which had been previously charged with a gas of a peculiar nature, men would, to a certain extent, throw off all selfconsciousness, and restraint and their real character, disposition and mental tendencies would assert themselves.

In the case of Mr. Johnston the result had been exceedingly ridiculous, and while out of respect for his family and friends he did not care to mention all that he had discovered concerning the real character that gentleman concealed behind a most polished exterior, yet it was enough to mention that he seemed to possess an uncontrollable desire to sing, "Scotch Lassie Jean," "Annie Laurie," etc., with occasional intervals when he would talk about the Whiting Cupola and its myriad points of excellence in such a rapid way that he could hardly be understood, all this time accompanying his remarks with the most rapidly executed gestures possible. When spoken to he would listen quietly, but only for a few minutes, and then he would break out afresh. The most astounding part of it was the extraordinary thirst that seemed, in this case, to accompany the experiment, when tried on Mr. Johnston, and he felt anxious to know if that was peculiar to that gentleman.

Mr. True said that if it could be arranged, he felt that it would be a good plan to have the room in which the club met made perfectly air-tight, and if that was done he would endeavor before the next session to install a complete plant, and all those who desired might enjoy themselves to the limit.

As no one imagined that there would be anything amiss in his own account, and as all thought, or seemed to think, it would be funny to see and hear the other fellow, the president was unanimously instructed to have all the necessary arrangements made and charge the expense to the Whiting Foundry Company, who would doubtless be greatly benefitted.

The secretary then read the following from J. A. Walker, of the Joseph Dixon Crucible Company, which he reported having received some time ago:

"Office of Joseph Dixon Crucible Co.,
"Jersey City, N. J., July 16th, 1897.

"The copy of July FOUNDRY with the Plumbago Club flag on page 233, is received and contents noted.

"We have in memory a good many kinds of nights; there are the "Arabian Nights," Summer Nights and Winter Nights, and some people have memories of "Ten Nights in a Bar Room," and some of Ten Bar Rooms in One Night, but the Plumbago Club Nights exceed them all in interest.

"Your reference to a lubricant for the world's axis was not as complete as it might have been because every time a poor, deluded geographer goes to the North Pole, he takes with him a box of Dixon's Lubricating Graphite to lubricate said pole. Dr. Kane took one, Greeley took one, Dr. Franklin took one, and the man who has the balloon which is to leave Spitzbergen to-day, has a box also, with instructions to apply it in good shape to the North Pole.

"The published reports of the Plumbago Club are very interesting; they bring up pleasant memories of pleasant days and pleasant nights spent in a pleasant city, and in pleasant company, amid pleasant scenes and pleasant everything, and the chief face that peers out of the whole crowd, the central figure, the hub of the whole thing was J. D. Smith, the own and only; the Alpha and Omega; the ever-present, always sober, effervescent, jolly, good-natured, witty, sensible, far-seeing, tactful, irrepressible, original, popular, unselfish, capable, clever and unassuming president of the smoothest club the world has ever known.

"No graphite is needed where he is. The business and the pleasure of your gatherings go along in the smoothest possible way, lubricated by his oleagenous, gentle manner, and ability as a presiding officer. If Thomas

B. Reed could only be present once, and see how deftly he controls the unruly spirits (corked and uncorked) that make up your gatherings, what a good thing it would be for the country, or better still, why not send Mr. Smith to Congress, have him elected speaker, and be done with it?

"We intend in the near future placing on the market a new brand of plumbago that will work equally well, whether used as a lubricant, facing, paint, hair restorer, breath purifier or cure for fleas, and purpose calling it after the slickest article the business has yet produced, the president of the Plumbago Club.

"Your for all there is in it,

"J. A. WALKER."

After the storm of applause that greeted the reading of this epistle had died away, Mr. J. S. McCormick, of Pittsburg, moved that Mr. Walker's communication be run through the rolls of some good sugar machine, the molasses extracted from it, and that the letter be then placed on file, the molasses to be shipped back to Jersey City in barrels and to be used to feed Jersey mosquitoes, which are said to be unusually ravenous this season.

A motion was offered by E. E. Arensberg, of the McCollough-Dalzell Crucible Company, of Pittsburg, that every member present be requested to either tell a true story, sing a song or buy the ginger ale.

A. J. Miller, of Providence, was first called up, and attempted to entertain the audience by an account of the many virtues of a new grade of molding sand sold by the Whitehead Company, and which was guaranteed not to blow, scab, wash, drop or burn out and suitable for the heaviest and lightest work. He was stopped by the chairman, who said it was the champion lie of the year, and Mr. Miller bought.

Secretary Frohman was invited to step to the front, but begged to be excused, and said that his recently published paper on foundry facing contained all he knew or all that it was necessary for anyone to know about the facing business, and he felt as if his reputation was established.

Amid the roar of laughter that followed some one turned off the lights, and those who were able tried to reach the door, and the meeting came to a close.

The president remained behind to see that the janitor took charge of John Hill and the balance of the members dispersed in various directions.

A Hot Wave Coming.

Who would not accept the following invitation?

Office of One of the Presidents of the Plumbago Club of America.

Cincinnati, O., Aug. 18, 1897.

To the Officers, Members and W. B. Members of the Plumbago Club of America:

It having come to the knowledge of the undersigned, that a large party of western foundrymen propose to congregate in the good city of Cincinnati, Ohio, on some days during the month of October, 1897, for a purpose not as yet known—you are hereby notified and officially requested that at the time specified you will carefully and properly pack your grip, and orderly and quietly proceed to said city, where you will personally record your appearance at the headquarters of this organization.

By order and consent of

J. D. SMITH, President.

Among the Foundries.

The Rocky Hill (Ct.) Foundry Co. have resumed operations.

Kiechle & Co., of Evansville, Ind., have reopened their foundry.

Dodson & Sutton will remodel their brass foundry at Hamilton, Ont.

Walthers Bros. have about completed their foundry at Coxsackie, N. Y.

The Delaware Iron Works, at New Castle, Del., has resumed operations.

The Albion Iron Works, of Victoria, B. C., have lately enlarged their plant.

Graham Bros., of Oakland, Cal., are having an addition made to their foundry.

The Prairie Stove Foundry, Terre Haute Ind., will be enlarged in the near future.

The Gadsden Pipe Works, at Gadsden, Ala., will increase the capacity of its plant.

The foundry operated by A. Fisher, at Macomb, Ill., is now operated to its full capacity.

The Logan Foundry & Machine Works at Logan, O., has been purchased by O. C. Pierce.

Rowell & Co., of Hartford, Wis., have recently made extensive alterations in their foundry.

The Manchester Brass Foundry has been organized at Manchester, N. H., by H. L. Robbins.

The Charleston (Ill.) Foundry Co. have recently put on the market a new style of heaters.

The Milwaukee Harvester Company, Milwaukee, Wis., has begun work on a $20,000 addition.

The Stoner Iron Works, of Riverside, Cal., are to be equipped for making agricultural machinery.

John Scott, of Quakertown, N. J., is removing his foundry and machine shop to Flemington, N. J.

Wm. McFarland, of Trenton, N. J., is said to contemplate an increase in facilities at an early date.

A foundry and machine shop will be erected at Toronto, Ohio, by Messrs. Fusner, of Cambridge.

The Avery Plow Works, of Louisville, Ky., have resumed operations after nearly three years' idleness.

James W. Mills has purchased the foundry at Howell, Mich., and will at once put it into active operation.

Seifert & Son, of Philadelphia, Pa., are reported as intending to establish a foundry at Norristown, Pa.

The Toledo Foundry & Machine Co. is reported to have received several orders from Yokohama, Japan.

The Warren Foundry, at Flint, Mich., has been sold to McCorkle & Hurd, who expect to operate the plant.

The York (Neb.) Foundry & Engine Co. is exceptionally busy with several large orders for mining machinery.

The Belfast Machine & Foundry Co., of Waldo, Me., will hereafter make a specialty of quarry machinery.

The Kingston (Pa.) Machine and Boiler Co. are building an addition to its plant to be used as a foundry.

The South Cleveland Foundry Co., of Cleveland, O., have resumed operations after an extensive shutdown.

The Neill Stove Manufacturing Company, Portsmouth, Ohio, are putting up an addition to their mounting room.

Graves & Kinney, of Holyoke, Mass., have turned their business over to the Worcester Iron & Foundry Company.

The Reading Car Wheel Company is improving its plant at Reading, Pa. An electrical plant will be installed.

The Boynton Furnace Co., of Jersey City, N. J., have put their foundry into operation with a full complement of men.

Alfred Streeter, of Winchendon, Mass., is reported as intending to locate a foundry and machine shop at Frederick, Md.

Joseph Connelly & Son, operating the Brookhaven (Miss.) Foundry and Machine Shop, have lately remodeled their plant.

The Plymouth Foundry Co. is the name of a new firm which has lately engaged in the foundry business at Plymouth, Wis.

The Silver Bros. Iron Works at Salt Lake City, Utah, are reported as having secured several large orders for mining machinery.

The George B. Sennett Co. has been organized at Youngstown, O., with a capital of $100,000, to manufacture heavy machinery.

Bamford & Guichard have retired from the management of the Walla Walla (Wash.) foundry, and J. L. Roberts has taken charge.

The Riverside Iron Works at Wheeling, W. Va., which was destroyed by fire, is being replaced with a modern fire-proof foundry.

The Hutchinson (Minn.) Foundry & Machine Co. will shortly place a new lawn mower on the market designed by Mr. F. A. Keene.

Ground has been broken for the new foundry of the Torrey Roller Bushing Company at Bath, Me. The new building will be of brick, 40x60.

The Baltimore (Md.) Malleable Iron & Steel Castings Co. (Patrick Kennedy, proprietor) has completed its new foundry and has it ready for operations. The new addition to the plant is a brick and iron building, with slate roof, 80x200 feet in size, and 200 more men will be given employment.

The Summit Foundry Co., of Geneva, N. Y., has been incorporated, with a capital of $35,000, by William Reid, Roger Hogan and Joseph F. Quay.

The Fairhaven Iron Foundry Co., of Fairhaven, Mass., has the contract to cast six mushroom anchors for the United States Lighthouse Board.

Messrs. A. Weiskittel & Son, Baltimore, Md., will shortly begin building a new foundry near their enameling works, which are just being completed.

The Phoenix Brass Foundry Co., of Hartford, Ct., has filed in the State Secretary's office a certificate of increase of capital stock from $6,000 to $18,000.

At Ft. Wayne, Ind., the Ft. Wayne Foundry & Machine Co. has been formed. The directors are J. H. Bass, C. T. Strawbridge, F. S. Lightfoot and J. M. Barrett.

At the annual meeting of the Erie Foundry Co. at Rochester, N. Y., Frank H. Clement John Buckley and J. Elwood McKelvey were elected directors for the coming year.

Caskey Bros., of Newport News, Va., have recently completed a large number of manganese bronze castings for several of the battleships now under construction.

J. W. Branch, formerly of Greenville, has taken possession of the foundry at Coral, Mich., and resuscitated an enterprise that has long been in a comatose condition.

At Austin, Tex., the Dallas Foundry & Machine Co. has been incorporated. J. W. Fuller, George W. Sams and Joseph Chase, of Dallas, are among the incorporators.

The Edwards Foundry, at Lowell, Mass., has been purchased by Anthony A. Robinson, who, in company with his brother, will put the plant into active operation.

The Griffin Wheel Company is enlarging its car wheel plant at South Tacoma, Wash. The buildings will be extended, and new cupolas, engines, boilers, etc., installed.

E. W. Kerrihard has purchased the foundry of Ed. Dehart at Red Oak, Ia. After repairing the damage recently done by fire the plant will be put into active operation.

Pickands, Mather & Company, Cleveland, O., propose to blow in their Alice furnace at Sharpsville, Pa., after a year's idleness. The furnace produces Bessemer iron chiefly.

The Norwalk (Ct.) Iron Works Co. is reported as considering the advisability of moving their plant to Bridgeport, Ct., owing to the lack of room at their present location.

The Brantford Machine Tool Company, Brantford, Ont., has been incorporated with a capital stock of $150,000, to manufacture machinery, castings, machine supplies, etc.

The Excelsior Foundry Co., whose plant in West Bay City, Mich., was destroyed by fire July 23, will rebuild on Washington street across from Wheeler & Co.'s shipyard.

The Amelith Plow & Wagon Manufacturing Co. are building a large factory at Bay City, Mich., for the manufacture of plows and wagons. C. B. Gillett is manager and secretary.

The Neal Co., of Daleville, Ind., have purchased the stove foundry hitherto conducted by the Girard Stove and Foundry Co. at Youngstown, O., and will remove to the latter place.

The A. M. Duncan Foundry & Machine Co. at Green Bay, Wis., is reported as having lately secured enough orders to operate their plant at its fullest capacity until the end of the year.

The Clinton Foundry Co., of Clinton, Mass., have installed a twenty horse-power gas engine in their foundry. The same firm has also added a complete brass foundry to its plant.

The Thomas Brass and Iron Company, Waukegan, Ill., expect to build a new foundry next year. Their present plant will be used for the manufacture of the Walrath gas engine.

The Standard Malleable Iron Co., of Muskegon, Mich., which took hold of the old Michigan Machine & Foundry Co.'s plant about a year ago, has erected a large addition to its plant.

Mr. W. J. Woodside, who five years ago retired from the management of the Union Foundry at Zanesville, O., owing to ill-health, will resume his old position as manager on September 1st.

The Jeanesville Iron Works Company, which intends to manufacture mining machinery, has been organized. It has a capital of $200,000, and will operate works at Jeanesville, Luzerne county, Pa.

The Lehigh Foundry Company, owners of the Blakeslee Foundry, South Allentown, Pa., have sold the property to the Midvale Foundry Company, who have been lessees of the plant for several years.

The Pultney Foundry and Engineering Company, Youngstown, Ohio, manufacturers of engine and rolling-mill machinery of all kinds, is operating its plant to nearly full capacity, with a fair amount of work on hand.

The Deering Harvester Company, Chicago, is adding new buildings to its plant, which occupies 63 acres. These buildings are of brick and stone. One is four stories high, 84x271 feet, and the other is one story, 27x62 feet.

The National Malleable Castings Company have lighted the fifth furnace in their foundry at Haughville, an Indianapolis suburb. It has been three years since their business justified the operation of so large a part of the plant.

The H. Wetter Manufacturing Company, of Memphis, Tenn., is erecting a new foundry. The officers of the company are as follows: President, A. G. Ryley; vice-president, J. W. Wynn; manager, C. C. Huntington, and secretary and treasurer, J. J. Sohm.

J. H. Whittemore, founder of the Naugatuck (Ct.) Malleable Iron Co., has withdrawn from that concern. The company was at once reorganized with the following officers: President, Lucian D. Warner; secretary, Adelbert C. Tuttle; treasurer, Charles L. Berger.

The Palmer Hardware Company has purchased the foundry of the Empire Forge Co. at Lansingburgh, N. Y. The foundry will be put into immediate operation, as the new owners intend to supply themselves with the large number of castings which they have hitherto purchased from outsiders.

The Oneida National Chuck Co. has been organized at Oneida, N. Y., with a capital of $70,000, to manufacture lathes, chucks and machinery. The incorporators are William Whitlock, 39 Cortlandt street, New York; Julius J. Smith, Herman M. Reynolds, Frank P. Klock, Louis J. Myers, George A. Quackenbush, Oneida, N. Y.

The George Sweet Manufacturing Company, of Danesville, N. Y., whose large plant was burned some time ago, have let the contract of rebuilding to Jacob Wolfanger, of Woodsville. The work will be commenced at once on the old site and is to be completed in sixty days. The buildings will consist of machine and boiler shops.

The Vulcan Foundry Co. has been organized at Pawtucket, R. I., with a capital stock of $100,000. Darius L. Goff, Gardiner C. Sims, William H. Haskell and William P. Dempsey are the directors, with Darius L. Goff as president and William H. Haskell as treasurer. Work has been commenced on the plant and it will be pushed to a rapid completion.

The King & Andrews Company, 216 to 222 North Union street, Chicago, have increased their foundry floor space about 10,000 square feet and have added a new 30-ton crane, besides making various other improvements in their plant to keep up with the enlarged demand for their products. They are the proprietors of the Semi-Steel Company, making semi-steel castings.

The Southern Stove, Hardware and Foundry Company, of Chattanooga, Tenn., has been organized. The company is composed entirely of negroes, and enjoys the distinction of being the first manufactory of the kind in the South controlled exclusively by negroes. The incorporators are C. H. Fearn, D. B. Gordon, Will Martin, B. E. Gordon, H. Martin and W. L. Fearn.

Wm. Duncan & Co., of Nashville, Tenn., have leased the foundry department located at the penitentiary in that city and will pay the State from 50 to 65 cents for each hundred pounds of castings turned out, the minimum amount to be thus paid to be $1,500 per month. The lessees further agree to increase the capacity of the foundry after eighteen months to 40,000 pounds per day.

The Washington Coal and Coke Company will greatly increase its capacity at Star Junction, Pa., making it one of the largest plants in the Connellsville region. Plans have already been prepared for 320 coke ovens of the bee-hive pattern, and a tipple of large size. The plant is now running at

its full capacity, and is putting out about 30 cars of coke per day, the remaining 70 cars of coal being shipped for coking purposes.

The Union Car Company, of Depew, N. Y., has leased the shops of the Schuylkill Navigation Company, at Reading, Pa., and proposes to build a foundry and other buildings at that place to make chilled car wheels. The plant will be in charge of R. E. Coleman, who is also general superintendent of the company's works at Depew. It is reported that the contract for the foundry, which will be 100x150 feet, will be let at once. The proposed capacity is 400 wheels a day.

George Bemarkt, who for the past ten years has been operating the West Side Foundry in Kansas City, Kans., has commenced the erection of a new foundry in that city to cost $15,000. The old works have become too small for the increased business and Mr. Bemarkt decided to build him a new plant. The new building will be a two-story brick structure, 150x54. It is to be modernly arranged and will be one of the best institutions of its kind in the west when completed.

The Belle City Malleable Iron Company, of Racine, Wis., which has been under the management of John T. Llewellyn, formerly of the Illinois Steel Company, the past two years, has been running full recently and a night force has also been required to take care of orders. The company has completed an air melting furnace. Plans have been given out for bids on a foundry 150x85 feet, with new core ovens and japanning and trimming ovens. The addition will give work to 100 more men.

The Girard Stove and Foundry Company, Youngstown, Ohio, formerly manufacturers of Adelbert stoves and ranges, have sold their stove business to the Ideal Stove Company, of Daleville, Ind. The Girard Company will in the future devote their entire attention to the manufacture of rolling-mill machinery and rolls, and will hereafter be known as the Youngstown Foundry and Machine Company. At the annual meeting the following officers were elected: Thos. Parrock, president; Wm. J. Wallis, vice-president and manager, and F. A. Williams, secretary and treasurer.

The new furnace of the Union Iron Works, Buffalo, N. Y., will be 76 feet high, with 17-foot bosh, but the dimensions of the shell are such that the bosh may be enlarged. The furnace will be equipped with four hot blast stoves, each 73½x20 feet, of the central combustion chamber type. The iron will be tapped into a 60-ton mixer, whence it will be poured into smaller ladles handled by an overhead electric crane which will command the entire length of the cast house and a part of the iron yard. The iron will be cast into molds, prepared by a molding machine, capable of molding a bed at a time.

The plant of the Edinburg Foundry and Machine Company, Edinburg, Ind., is offered for sale. It covers half a square in the center of the town, and represents a cost exceeding $40,000. It will be sold for less than half that sum, or the realty will be reserved and machinery, repair stock, etc., sold for less than $10,000. The company made money until a $30,000 loss in one lump occurred just at the panic of 1893, and the plant was then sold out by a receiver. The owners of the past two years, being engaged in other business and unacquainted with the manufacture of wood-working machinery, desire to dispose of it.

The McCormick Harvesting Machine Company, Blue Island and South Western avenues, are about to erect at their works the largest foundry in the west, if not in the country. It will be five stories high and will have a capacity of 200 tons of castings per day. Their old foundry buildings are now being torn down to make room for the new structure. In the latter it is intended to do the molding and casting on the top floor of the building, where will be located two No. 9 Whiting cupolas, each having a melting capacity of from 14 to 18 tons per hour. The chipping and cleaning rooms will be on the lower floors.. The construction work will be pushed as rapidly as possible, and this new foundry will be one of the most complete in the world. The greater part of the molding in this plant has been done on machines and the latter practice will be continued in the new plant.

Accidents.

The foundry of the Brooks Locomotive Works, at Dunkirk, N. Y., was struck by lightning July 20. Considerable damage was done to an electric traveling crane.

An accident at the works of the Penn Steel Casting and Machine Company, Chester, Pa.,

through the falling of the traveling crane, caused the death of two employes, and probably fatal injuries to a third. The crane was built to handle thirty tons, and had only 5,000 pounds in charge at the time.

Fire Fiend.

The Harrisonville (Mo.) Foundry had a fire on July 28; damage nominal.

At Aberdeen, Miss., J. F. Enderton's machine shops and foundry burned; loss $15,000.

The plant of the Cedar Rapids Iron Works, at Cedar Rapids, Ia., was damaged by fire recently.

The foundry and machine shop operated by John A. Bunn, Cayuga, Ont., burned; loss $2,000.

A small blaze took place at the plant of the American Steel Casting Company, at Sharon, Pa., July 10.

At Toronto, Ont., fire at the works of the Toronto Brass Company, did a damage of $25,000 to the brass plant and other property.

The Pacific Iron Works, at Bridgeport, Ct., had several hundred dollars worth of damage done to their machinery by a recent fire.

The Union Foundry and Machine Company, of Rockford, Ill., was badly damaged by a fire, started in an adjoining building, August 5.

The foundry owned by Charles Schenck, at Columbus, Ohio, was visited by fire July 31. $5,000 worth of patterns were destroyed; no insurance.

The foundry belonging to the J. B. Ehrsam Machine Company, at Enterprise, Kansas, caught fire recently and was damaged to the extent of $3,000.

Fire in the two upper stories of the building at 312 North Eighth street, St. Louis, Mo., occupied by the Enterprise Brass Co., did $30,000 damage on August 12.

The foundry of the Goulds Manufacturing Company, at Seneca Falls, N. Y., was visited by a small fire, which was extinguished before much damage had been done.

Sparks from the blacksmith shop in McNeil & McNeil's Iron foundry, at 13 Franklin street, Brooklyn, N. Y., caused a fire which resulted in damaging the building to the extent of $3,000, and the machinery $1,000.

The plant of the Pittsburg Foundry and Machine Company burned July 30, entailing a loss on Velt & McDonald, the proprietors, of $9,000. The concern made a specialty of sewer tops and fittings for catch basins. Loss on stock made and ready for shipment was $12,000.

The Whittemore machine shop and foundry in West Bay City, Mich., operated by the Excelsior Machinery Company, was damaged by fire July 24. The Excelsior company's loss is $3,000; partly insured. Wheeler & Co., who were having all their shipbuilding castings made at this shop, lose $1,500 on patterns, with no insurance. Whittemore's loss will be covered by $13,000 insurance.

Obituary.

ANDREW MILLER.

Andrew Miller, a native of Glasgow, Scotland, and for a number of years foreman for the Belcher & Taylor Agricultural Tool Company, at Chicopee Falls, Mass., expired after a lingering illness.

FRANCIS ALLEN.

Francis Allen, a prominent manufacturer, died at his home at Hermitage, Pa., July 14. He was born in Luzerne county, March 17, 1817. His parents were natives of Ireland. In 1852 he took the management of the Clay furnace and first demonstrated that lake ore could be smelted with coal. He was also interested with Wood & Sons, at Wheatland, and amassed a fortune.

J. B. GLOVER, JR.

In the death of J. B. Glover, Jr., on August 16, Marietta, Ga., loses one of her most progressive citizens. About six years ago he established the Glover Machine Works, and by hard work he succeeded in building up a large business.

Mr. Glover was a graduate of the Lehigh University, of Bethlehem, Pa., and much of his success was due to the superiority of his early training.

A Great Help.

A great help to foundrymen in gaining various ideas from all over the country.

H. B. HOYLE,
Star Foundry Co., Worcester, Mass.

Crucible Making and How They Should be Cared for.*

To the last half of the nineteenth century—just closing in such a blaze of metallurgical and industrial glory—belongs the graphite industry; so much so, in fact, that graphite has become one of the great factors in our modern civilization.

To speak mineralogically, graphite belongs to the coal family and is classified with the carbon minerals.

To speak chemically, it is a pure carbon, and has substantially the same analysis as charcoal and the diamond.

To speak geologically, it occurs only in the oldest Archaic rocks and is the product of an unmeasureable heat.

To speak electrically, it is one of the best conductors of the subtile electric current.

And, to speak colloquially, it has entered every civilized home in the form of stove-polish for the kitchen, and the lead pencil for the library.

It has revolutionized metallurgy by its use in the making of crucible or melting pots.

As a mineral it crops out all over the globe, but as an ore of a suitable quality, and in sufficient quantity to pay for mining and refining, it is confined to three or four well-known localities.

The most notable product of the graphite industry for foundrymen is the graphite crucible, or melting pot, hence the subject assigned to me is "Crucible Making and How they Should be Cared For."

Crucibles or melting pots of some description have, of course, been used since the first fusion of metals by man. We all know the legend, that the earliest alchemists marked their crucibles with a cross (hence the word "crucible") to prevent the devil from interfering with the chemical operation about to be performed. This legend, whether true or not, shows the antiquity of the melting pot.

Before the present century, crucibles were made chiefly of sand and clay, but what we know as the modern graphite crucible, more commonly known as plumbago, or black lead, was originated in the year 1827 by Joseph Dixon, then living at Salem, Mass. So it is to the present century, and to an American that the world owes this useful invention.

In its broadest sense, a crucible is the vessel in which a fusion of some substance is conducted. Crucibles differ widely, according to the substance to be fused and object of the fusion. They differ in composition, shape, and size, from the tiny platinum crucible of the laboratory and the average melting pot for brass or steel melting, to the fifty ton hearth of the modern steel furnace.

Crucibles are used in various parts of the world, platinum crucibles for laboratory work, sand crucibles, so-called, made from Hessian clay and sand, straight out clay crucibles made from English clay, and the melting pot known to all foundrymen as the black lead or plumbago crucible, which, is more correctly speaking, the graphite crucible.

JOHN A. WALKER.

While the use of the Hessian sand crucible still lingers among assayers, and while English steel makers still cling to the use of the one heat clay crucible, the vast bulk of all the metals and their alloys is fused in the modern graphite crucible.

As before mentioned, graphite crucibles were first made in 1827 by an American. Later the American taught the Englishman, and still later the practice traveled to France and Germany, Japan and China, and now, to the best of my knowledge, the making of the graphite crucible is confined to France, Germany, England, Japan, China and America. America, however, has taught the world.

* Paper read before the Convention of the American Foundrymen's Association, Detroit, 1897, by John A. Walker, Vice-President of The Joseph Dixon Crucible Co.

The theory of the graphite melting pot is that, vastly better than anything else, it is a ready conductor of heat, and at one and the same time, it is both strong and elastic. Again, it is refractory and durable. Being the best conductor of heat, the coal bill is minimized, and quick melting possible. Being strong and elastic, it stands all reasonable shocks and accommodates itself to radically different temperatures. Being refractory, the most stubborn metals succumb and become fluid long before the walls of the pot show the slightest sign of collapse.

The making of crucibles is based on a well defined theory and the crucible making plant should be under the sharpest supervision of its manager and his trained assistants. They must be possessed of the latest knowledge of metals and their alloys, of furnaces, of fuels, of fluxes, and of the mechanics and the chemistry applied by the people who use their crucibles.

A successful crucible maker must make constant chemical analyses of his materials, and he cannot have too much knowledge of the broad lines practiced by his customers.

The fusion point of different metals is vastly dissimilar. This must be taken seriously into account. For instance, the crucible made for steel melting is useless in a brass foundry. It is far more refractory, it is true, but if the brass melter employed a crucible intended for steel melting, it would slowly wither away in his lower temperature, while it would behave beautifully in a furnace with heat 1,000 degrees Fahrenheit higher.

Intimate knowledge of fuels and their function is also absolutely necessary to the crucible maker. He must know not only the behavior of the several fuels; as coal, coke, or gas, and perhaps electricity, but also the quality of these several fuels, as not only a change from coal to oil, but a simpler change of from one coal to another has an intimate bearing on the life of a crucible. Then, what suits one melter does not seem the best for another working under apparently like circumstances. To illustrate: A customer of the Dixon Company once complained of poor results in his large foundry and insisted the fault was in the crucibles. We were convinced that it was not, as his results were uniformly poor, so we proposed to him that we take from the same batch and the same kiln burning, 200 crucibles of the size he used, divide them into two shipments of 100 each, he to receive one shipment, we to send the other 100 to a shop of like renown, and doing similar work, and exchange results. This was carried out to the letter. Four weeks later when both sets of 100 were used up, reports showed that in the other foundry the average was 42 64-100 heats, but in his foundry the best run was 18 heats, while the average was between 14 and 15 heats.

This seemed to be knock-down proof that the crucibles were not only all right, but that his practice was either bad, or his fuel unsuitable, or the crucibles not adapted to his work.

Again, the crucible maker should know of the nature of the fluxes used, and try to be informed of the crucible users' preference in fluxes. These fluxes chiefly attack the binding materials in the walls of the melting pot. To some fluxes these binding materials are impervious, to others they are an easy prey. To illustrate again, it is an everyday occurrence in our office to get letters inquiring what we know as to the effect of this or that substance on the walls of the crucible, and last week a metallurgist called, and after telling his wants in the way of a special crucible, and listening to our explanation of what we could do, paused a moment in thought, and then said: "Well, shall I change my flux, or will you change your crucible?"

Again, by slow and almost unperceived steps a very large use of the more fusible alloys has come, and come to stay. The market demands denser and stronger castings, and for this the fusion must be much more fluid. Hence the rapidly increasing use of Phosphorus, Aluminum and Manganese.

The use of these alloys not only adds strength and density to the castings, but promotes the fusion and increases the fluidity. This raises the question of the porosity or permeability of the wall of the pot.

If the crucible with these extra fluid fusions is not well chosen, or should it contain hair line cracks invisible to the naked eye, this very fluid mass will find such cracks and prepare the way for a leak. While we are

convened here, the British Iron and Steel Institute are in session in London, and the topic of one of their papers is "The Permeability of the Wall of the Crucible." In brief, the day has passed when a crucible is simply a crucible, or when one kind will suit all fusions, all fluids, all fluxes, and all furnaces, or to change the putting of it, there are graphite crucibles and graphite crucibles. It is not sufficient that the mixture carries graphite; the crucible must be specially adapted to its particular service.

So much for Crucibles and Crucible Making. We must now turn to the other half of my subject, viz.: "How they should be cared for," by which is undoubtedly meant how the user should use them.

First let me emphasize and iterate and reiterate that the value and life of a graphite crucible depend as much on the treatment it receives as on its own intrinsic quality. Last month we sent a special crucible to a New York brass founder for trial to verify a new purchase of graphite. In due time the worn out shell came back with a note saying 42 heats, but the customer added: "You must not expect this good result in regular work, as I supervised the trial of this pot myself," thus unconsciously emphasizing the difference between his handling and other handling.

In using a graphite crucible the first step is the annealing. When the crucible comes from the maker's kiln, where the temperature is very high, it is supposedly bone dry. It is, however, a porous vessel and it easily absorbs moisture, hence it should always be stored in a "bone dry place."

I have seen crucibles stored in a shed where both rain and snow came through cracks and broken windows and the crucible maker hundreds of miles away was "called down" later on because the pots "scalped."

As to annealing, both too little stress and too much stress can be laid to it. The best annealing is even heating, that is, evenly warm the pot, not on one side only, but around the pot, to a temperature say between 250 degrees F. and 300 degrees F., and maintain that heat there until all moisture is expelled. Nothing more is required except equal good attention should be given to the even cooling all around of the pot.

Four weeks ago a customer repeated his order and said: "Please send better pots next time." Some of the previous lot, he added, "broke on annealing." How a crucible can break in the preliminaries of a proper annealing is as yet an unsolved problem. In this case we went to the stock and found in the rear of the pile one of the same batch as those that he complained "broke on annealing." We took it to the boiler room, where the fire was in fine shape, and without a moment's preparation, or delay, threw the crucible on its side on the coal where the heat was a bright cherry red. The pot stayed there some twenty-five minutes with boiler doors closed until it was red hot. We withdrew it from the fire and immersed it in a bucket of cold water and let it cool till it could be touched, returned it to the fire the other side down, brought it the second time to a red heat and gave it a second cold water bath, and when it was once more cool enough to handle, it rang like a bell, and one could not see that anything had happened to it. This was from the same batch as the others that were reported "broken in annealing."

By a batch I mean that for convenient handling a given quantity of the crucible mixture is prepared at one time. This given quantity is called a "batch." As we work by many different formulas, each batch is numbered, a careful record kept of its ingredients, and further than this every individual crucible is stamped with its batch number, so that its pedigree can be ascertained at all times.

Our furnace man asked why we were testing the crucible in the manner that I have mentioned, and on being told that duplicates had "broken in annealing," said: "I guess he annealed them with a sledge." The pith of annealing is that the crucible walls should be heated and cooled off evenly, and that it receive heat enough, and no more than enough, to expel its accidental moisture. An additional word is specially suggested, if the crucible is a large one: After toasting its outside walls, set it over a black, low, slow fire, bottom side up, so that the inside walls as well as the outside can feel the good of the toasting process. Do not, for annealing purposes, set a crucible bottom side down at an angle say of 30 degrees in the hole of a hot furnace hole. We had one returned some months since that had

been treated that way. The flame marks on the bottom of the pot showed this, and we, the makers, were blamed and asked to send a new one because it had scalped. We woul l have been placing and replacing until this day if that practice had continued.

After annealing, the next thing is to get the glaze on the crucible as soon as possible, by as rapid first firing as possible, consistent with the safety of the pot.

The mixture of the crucible contains ingredients that at a sufficiently high heat ooze out in a vitreous and glass-like paste, which after flowing down the sides of the crucible, sets, covering the crucible with a protective coat. You must also remember that the graphite in the crucible is carbon, and free oxygen will, if permitted, unite with the carbon and take it away. When this takes place, the graphite has disappeared and it looks like a clay vessel. The melter then complains to the crucible maker, saying: "The melting pots are not as usual, they have no graphite in them, and look like a clay pot." Then again, take any crucible and the microscope will reveal over its surface, invisible to the eye, fine hair cracks. All this the glaze will take care of. Once the crucible has this protective glaze, the oxygen is powerless to disturb the graphite and the invisible hair cracks are sealed.

The furnace draughts and dampers should be so regulated as to produce a reducing flame instead of an oxydizing flame, the latter being, as before explained, always unfriendly to a graphite crucible. By a reducing flame we mean one where the dampers admit just enough air to burn the gases, and by an oxydizing flame is meant one with surplus air, which promptly goes for its affinity, and in the crucible it instantly finds its affinity in the graphite.

A third hint concerns the fit of the tongs. In a fire hot enough for brass or copper fusion, the crucible becomes soft and pliable. In lifting it to pour, if the tongs do not fit or are not made to grip the crucible at the right place, you may in the struggle to sustain the expensive charge, bend the pot too much, and it cracks.

The proper way is to grip the crucible just below the bilge so it will not need such a tight squeeze. Some melters use tongs shaped like the ace of spades, they grip better and remove the coal much more easily, thus preventing clinkers attaching to the pot.

Again, never allow any metal to cool in the crucible, but pour until the melting pot is entirely empty. In the parlance of the shop, don't leave the crucible so you will find a "button" in the bottom when it is cooled off.

In cooling, each button will have small threads or spikes of metal which will attach themselves to the soft crucible walls and become firmly fixed in them, and the walls of the pot are torn in getting them out.

After pouring your metal, don't roll the pot out of doors where it will get rained upon, or place it on a bed of wet sand, where it will absorb moisture. If you do, you put it exactly where, in its hot, soft condition, it will become spoiled either teetotally or partially. In lifting large pots by the crane, don't release the grip and let them drop four or five feet on a stone floor, rather hold the grip until within two or three inches from the ground, and then drop them, if possible, on a bed of old dry sand.

In filling the pot, don't pack ingots or scrap too tightly; expansion and contraction go on in the heating and cooling, and a little gumption is necessary here to prevent the pot from being strained or cracked.

In ordering your crucibles give the maker a hint, first as to your fuel, whether coal, coke, gas, or oil, then, as to the metal you melt, also, if possible, your average time of heat. He can then send a pot better adapted to your special work.

In the old times a crucible was made only by one formula, but now the Dixon Company make crucibles by twenty different formulas or mixtures as we call them, and produce coal fire pots, coke fire pots, oil fire pots, and gas fire pots and different crucibles for melting steel, brass, nickel, phosphor-bronze, and other metals.

A certain customer of ours noticed that he used up an invoice of pots in about half the usual time; he thought of his flux and sent us a small sample, we sent him another crucible making it by another formula, which overcame the difficulty. It was simply a case of better adaptation after we knew the nature of the flux.

Four causes of failure or unreasonably short life in a crucible we may mention:

First. The wrong kind for the service, either a pot unsuited to the furnace, to the metals, or to the fuels. Every up-to-date shop is now equipped with fierce draughts, taller stacks, corrosive fluxes, so that the old-time two and one-half to three hours' heat has dropped to one and one-half and one and three-quarters hours. Don't expect the crucibles to stand this extraordinary extra strain unless you are equipped with a crucible made with a knowledge of the special situation.

Second. The life is shortened by rough handling, a great deal of which is unavoidable. The melter's job is a hard one, he works always in an atmosphere of excessive heat, his eyes are invariably in distress, he lifts heavy weights of seething molten metal, he literally earns his bread by the sweat of his brow not only, but of his whole body, his work taxes his every nerve, and every muscle. Not much wonder then that now and then the tongs squeeze a pot to a crack, or he flinches from the sometimes extra care necessary.

Third. The life is shortened by corrosive fluxes. These fluxes are introduced to promote fusion and give clean slags. The crucible maker does not know what the melter will use, the melter does not always know the destructive influence of his flux on the walls of his particular melting pot.

I ask great respect for the graphite crucible, there are not many men and not many things in this world for which there are not substitutes, but for the graphite crucible there is no known substitute. It is a fragile thing, and you ask it to do and stand what nothing else in this wide world can do or can stand.

From the Woolly West.

The editor of the Hutchinson (Minn.) Independent run short of copy last week. After bumping his head against the corner of a freight car he was inspired to write the following, which is the best, of its kind, that we have seen for some time:

"The new foundry company made their first casting Tuesday evening after supper and drew a good house. About a hundred people were down to see the first pouring of hot metal that has taken place in Hutchinson for many, many months, and it was a very cheerful sight. The big crucible in the molding room was filled with white, hot molten iron, and when everything was ready Schuyler Billings, an old-time employe of the foundry, took an iron rod about four feet long and punched a hole in the outlet at the bottom which was stopped up with baked clay, and out poured a fiery stream of melted iron into the big pouring pot, emitting a shower of sparks that flew in all directions, and looked like fire works on the 4th of July. The opening in the crucible was stopped up with damp clay once more, and two men then took the big pot which was hung on an iron rod with a cross-piece at one end running at right angles, and carrying it quickly over poured it hissing hot into the molds. This process was repeated until all the molds were full and all the metal in the crucible exhausted. It is a hot job, and somewhat disagreeable, as the hot metal running into the molds fills the room with steam and smoke, and the noise of the foundry machinery in motion makes hearing each other talk almost out of the question. Not a piece was lost, and the first cast was entirely successful."

A Good Practice.

Since irons have been sold on a chemical analysis to insure uniform results in the castings, more or less trouble has been found in inducing foundry foremen and melters to keep track of the different shipments and thus insure the practical uniformity which this method of purchasing ought to insure.

At the time M. A. Hanna & Co., of Cleveland, O., constructed their Buffalo furnace, they adopted the same methods of grading foundry irons at this furnace, which had previously been employed at furnaces making Bessemer pig iron. As is well known, this practice consists in making analyses of everything which enters the furnace and also the resultant product

By this method M. A. Hanna & Co. have secured a high reputation for the uniformity of the iron produced at their Buffalo furnace. Those using it have become so accustomed to the reliance which they may place upon this iron and the analysis furnished with each car shipped, that in speaking of other brands, they will ask: How does it compare with "Buffalo?"

To aid foremen and melters in preserving a record of their irons and to avoid mistakes in the use of these this firm has issued for gratuitious distribution a small book consisting of tables ready to receive the record of each shipment of iron, a sample half page of which is shown below.

A. No.....Pig Iron

B. No.....Pig Iron

	A.	B.
Graph. Carbon.....		
Comb. "		
Sil'con.....		
Phosphorus.....		
Sulphur.....		
Manganese.....		

Date.....

A Good Thing.

We do not know what to call it.

A treatise on up-to-date business methods, a complete encyclopedia of all that is latest and best in the way of woodworking and patternmaker's tools, or a catalogue.

The last name seems to be the least appropriate, but the publishers, C. A. Strelinger & Company, Detroit, Mich., use that term in referring to it.

All this refers to a book of four hundred pages (pages nearly as large as THE FOUNDRY) and containing at a rough guess perhaps 3,000 illustrations.

We do not see how anyone, especially a patternmaker, could permit himself to be so seriously handicapped, now that this book can be secured, to be without it.

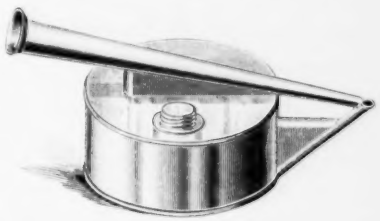
Not only does it tell of every woodworking machine and tool, but it explains tersely the difference between similar tools of different makes.

It is at once an authority on how to choose, buy and use every tool used in woodworking, from an awl or gimlet, to the largest band saw or planer.

It only costs a quarter, and the fellow who is trying to do business, as an American worker or manufacturer, without it is laboring under a great disadvantage.

An Improved Blow Can.

As too much water on a mold is just as bad as not enough, and as there are many parts of molds where the ordinary swab or sponge does not deposit water with sufficient delicacy, a blow can becomes a necessity.



We illustrate herewith an improved blow can, suitable for spraying all kinds of liquids on molds. It is manufactured from both copper and tin and sold by the S. Obermayer Co., Cincinnati.

There are not many—if any—men more favorably known to the foundry trade of the Central Western States than Mr. Andrew Hawthorne, for many years with the pig iron business in Cincinnati and Chicago, and Mr. S. H. Whittaker, both now with the Dayton Coal and Iron Company, Cincinnati, Ohio, whose furnaces are at Dayton, Tenn.

It is, therefore, perhaps not looking too far ahead to say that the newly formed firm of A. Hawthorne & Company, dealers in high grade foundry and furnace coke, and which is composed of the foregoing gentlemen, is destined to succeed.

They have secured offices in the Johnstone Building, at Cincinnati, and while still retaining their connections with the Dayton Company, they frequently find the opportunity to serve their many friends by supplying them with a first-class article of coke

Nothing Like It.

The August number of Cassier's Magazine is called the marine number, and it certainly is a whale. When we say that it weighs 2 pounds and 12 ounces the extent of its volume can be estimated. It is profusely illustrated with the best of half-tone engravings throughout. We did start in to count these, but got tired before we were half way through. It is a number that will be used as a book of reference for many years and something of which any publisher might well feel proud.

NOTICE!

Advertisements in this column, 30 cents a line for each insertion. About seven words make a line. The Cash and Copy should be sent to reach us not later than the 20th to insure publication.

Answers addressed to our care will be forwarded.

TO SUBSCRIBERS

whose names appear on our **subscription** list, we will give one free insertion under this heading to those in want of positions, the advertisement to occupy a space of not more than five lines. Additional space or insertions must be paid for in advance at regular rates.

FOR SALE—No. 3 Root blower, used only a few months; to be replaced with largest size. Address Box 4, care THE FOUNDRY PUBLISHING CO.

MALLEABLE—An annealer of recognized ability, progressive and economical, is open for engagement. Best of recommendations. Address Box 88, care THE FOUNDRY.

A MANUFACTURING CONCERN, desiring to place its foundry business upon a paying basis, can secure the service of a practical foreman by addressing "Practical," care THE FOUNDRY.

WANTED—The address of Mr. Fred Forster, who last year was at Texarkana, Tex., and left there for Memphis, Tenn. Interesting information awaits him. Texas Car & Foundry Co., Texarkana, Tex.

WANTED—Position by foundry foreman, 20 years' experience on all kinds of light and heavy castings; willing to work if need be; temperate; at present in the east; any location. Address Box 71, care THE FOUNDRY.

WANTED—An ambitious young foundryman with some experience and moderate capital to buy an interest in an old established foundry. Located in a live western city of 40,000 population. A splendid chance for the right man. References exchanged. Address "Standard," Box 87, care THE FOUNDRY.

WANTED—Situation as foundry foreman by one who has had ten years' experience as foreman on all classes of work. Thoroughly capable of handling a foundry in all its details. Can manage men to the best advantage and understands the melting and mixing of iron to obtain different qualities. Can give the best of references as to character and ability. Address Box 53, THE FOUNDRY.

The well known firm of James Leffel & Co., Springfield, Ohio, U. S. A., have issued a neat new Pamphlet "D," replete with numerous illustrations and descriptions of the throttling and automatic engines, with portable and stationary boilers, which they are building in a variety of sizes and styles. Copy is sent free to parties interested, on application to the company.

The Michigan Stove Co. has always been noted, not only for the excellence of the stoves and ranges turned out by them, but also for superior appearance of the advertising matter used in describing their product.

This company has lately issued a number of additions to their "Perpetual Catalogue," a feature of advertising inaugurated by them in 1895, which is so far above ordinary advertising matter as to entitle it to the name of "Garland"—the world's best.

The Newburgh Ice Machine and Engine Co., of Newburgh, N. Y., have issued an illustrated pamphlet describing ice making and ice machines. The Whitehill-Corliss Engine, made by this firm, is also illustrated.

The Mossberg & Granville Mfg. Co., of Providence, R. I., have issued their 1897 catalogue, describing "A Model Plant and What it Produces." Special reference is made to roller bearings, rolling, pressing and stamping machinery, in addition to which this firm also design and manufacture machinery for special purposes.

A directory of American manufacturers of heating and cooking apparatus, together with a list of the stove foundries of the United States, has been published by W. S. Adams, of Holyoke, Mass.

The book also embodies the names of stoves, ranges and furnaces, and by whom these are manufactured. The work should prove of special advantage to hardware dealers and others who are required to furnish repairs.

Has No Equal.

I have never in my 37 years of foundry experience met with any journal so suitable to the trade.

JOHN WATKINS,
Mansfield, Ohio.